



SIMPLY BETTER



Installation and Operating Manual for the
ProCon HT 150 & 225
Floor Standing Condensing Boiler Range.

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1.0 Appliance Type.

There are three build types within the ProCon HT range.

Please ensure you have the correct unit for the application and where required located correctly within the cascade prior to beginning the installation.

1.1 Single Units.

(150 Product Code 96.30000-7182)

(225 Product Code 96.30000-7183)

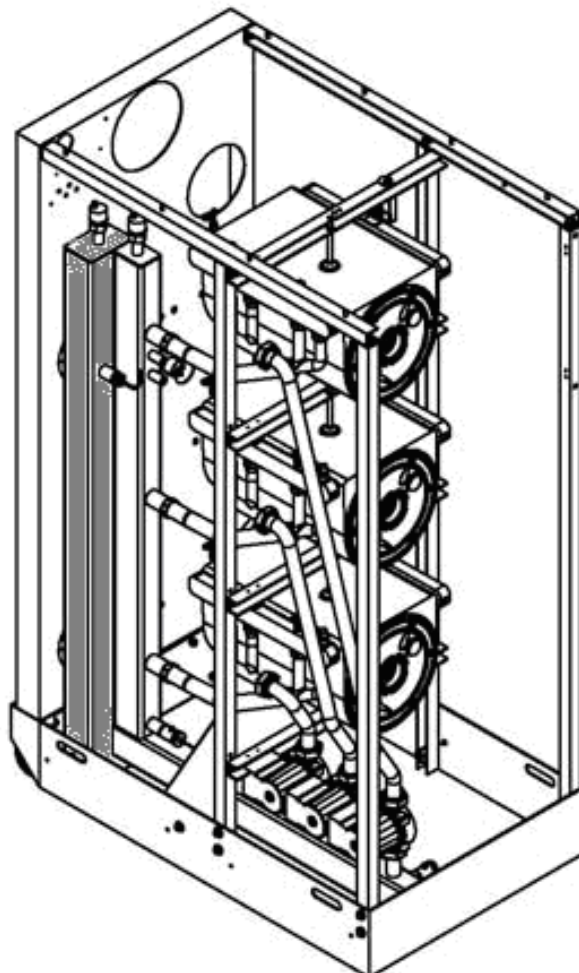
The Single Unit is supplied with an integral low loss header.

This unit does not require the installation of a second low loss header remote from the appliance.

The system's (Secondary) circulating pumps (Heating / HWS) are to be connected (hydraulically) to the appliances flow and return connections.

The Single Unit is supplied complete with an integral RVA47 Single Unit Cascade Manager wired to integral flow and return sensors.(QAZ21). An outside are sensor (QAC32) is also supplied and located in the base of the unit.

Integral Low
Loss Header.
Complete with
Flow and Return
Sensors



1.2 Cascade Manager Units

(150 Product Code 96.30000-7184)

(225 Product Code 96.30000-7185)

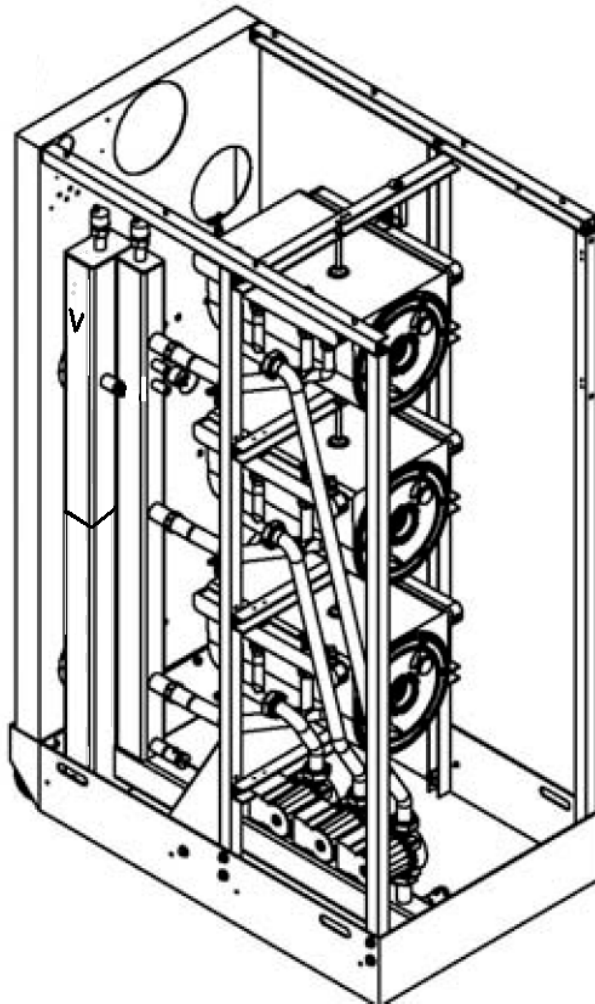
The Cascade Manager Unit is supplied without an integral low loss header.

A suitably sized low loss header must be installed within the system.

The system's (Secondary) circulating pumps (Heating / HWS) are to be connected (hydraulically) to the external low loss header and not to the appliances flow and return connections.

The Cascade Manager Unit is supplied complete with an integral RVA47 multiple unit Cascade Manager. Remote Flow and Return sensors (QAD21) must be mounted as indicated in the hydraulic diagram section of manual and wired back the unit. An outside are sensor (QAC32) is also supplied and located in the base of the unit.

Integral
Distribution
Header.



1.3 Cascade Slave Units.

(150 Product Code 96.30000-7186)

(225 Product Code 96.30000-7187)

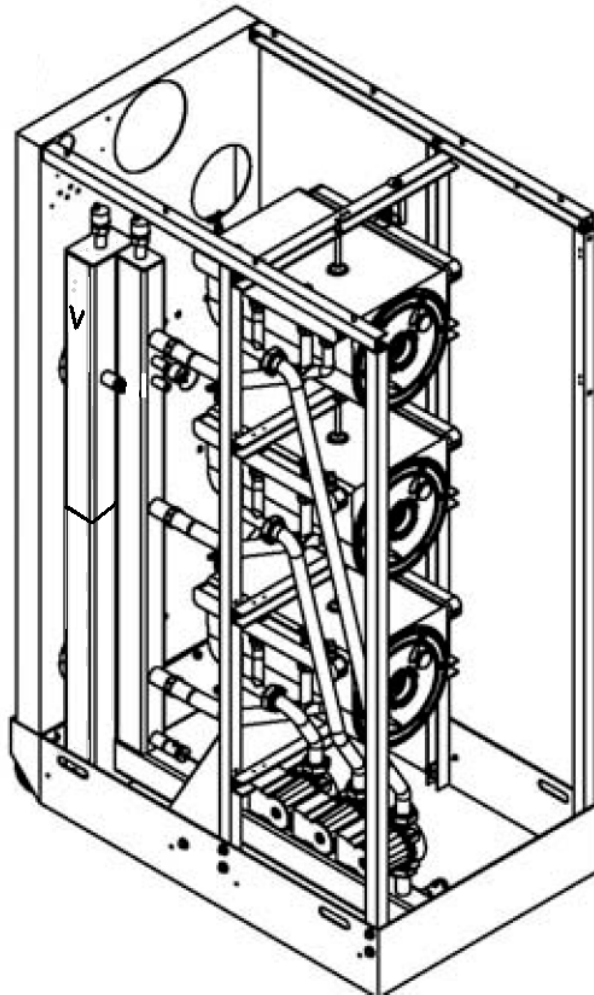
The Cascade Slave Unit is supplied without an integral low loss header and should only be installed where a Cascade Manager is also installed

A suitably sized low loss header must be installed within the system.

The system's (Secondary) circulating pumps (Heating / HWS) are to be connected (hydraulically) to the external low loss header and not to the appliances flow and return connections.

The Cascade Slave Unit is supplied without an integral RVA47 multiple unit Cascade Manager and therefore relies on the presence of a Cascade Master Unit to provide operational signals via the LPB communication wiring.

Integral
Distribution
Header.



2.0 Installation Regulations and Requirements

The installation of ProCon HT boilers must be in accordance with the relevant requirements of Gas Safety (Installation & Use) Regulations 1994, Health & Safety at Work Act, Building Regulations, IEE Regulations, Construction (Design & Management) Regulations 1994, Local Authority Bye-Laws, National, Fire Regulations and Insurance Company requirements.

The following Codes of Practice are also applicable:-

BS 5449: 1990 Specification for forced circulation hot water central heating systems for domestic premises.

BS 6644: 2005 Specification for gas fired hot water boilers of rated inputs between 70kW (net) and 1.8MW(net) (2nd and 3rd family gases).

BS 6798: 1987 Specification for installation of gas fired hot water boilers of rated input not exceeding 60 kW.

BS 6880: 1988 Code of Practice for low temperature hot water heating systems of output greater than 45kW. Parts 1, 2 & 3.

BS 6891: 1988 Specification for installation of low pressure gas pipework of up to 28mm (R1) in domestic premises (2nd family gases)

BS 7593: 1992 Code of Practice for treatment of water in domestic hot water central heating systems.

BS 7671: 1992 Requirements for electrical installations. IEE Wiring Regulations. Sixteenth edition.

CISBE Guide reference sections B7, B11 and B13.

CP342 Part 2: 1974 Code of Practice for centralized hot water supply.

GE/UP/2 Gas installation pipework, boosters and compressors on industrial and commercial premises.

IGE/UP/4 Commissioning of gas fired plant on industrial and commercial premises

IGE/UP/10 Installation of gas appliances in industrial and commercial premises. Part 1: Flued appliances.

And any addition prevailing regulation and or code of practice not detailed above.

2.1 Appliance Warranties

All MHG appliances enjoy a full 24 month warranty as detailed in our terms and conditions.

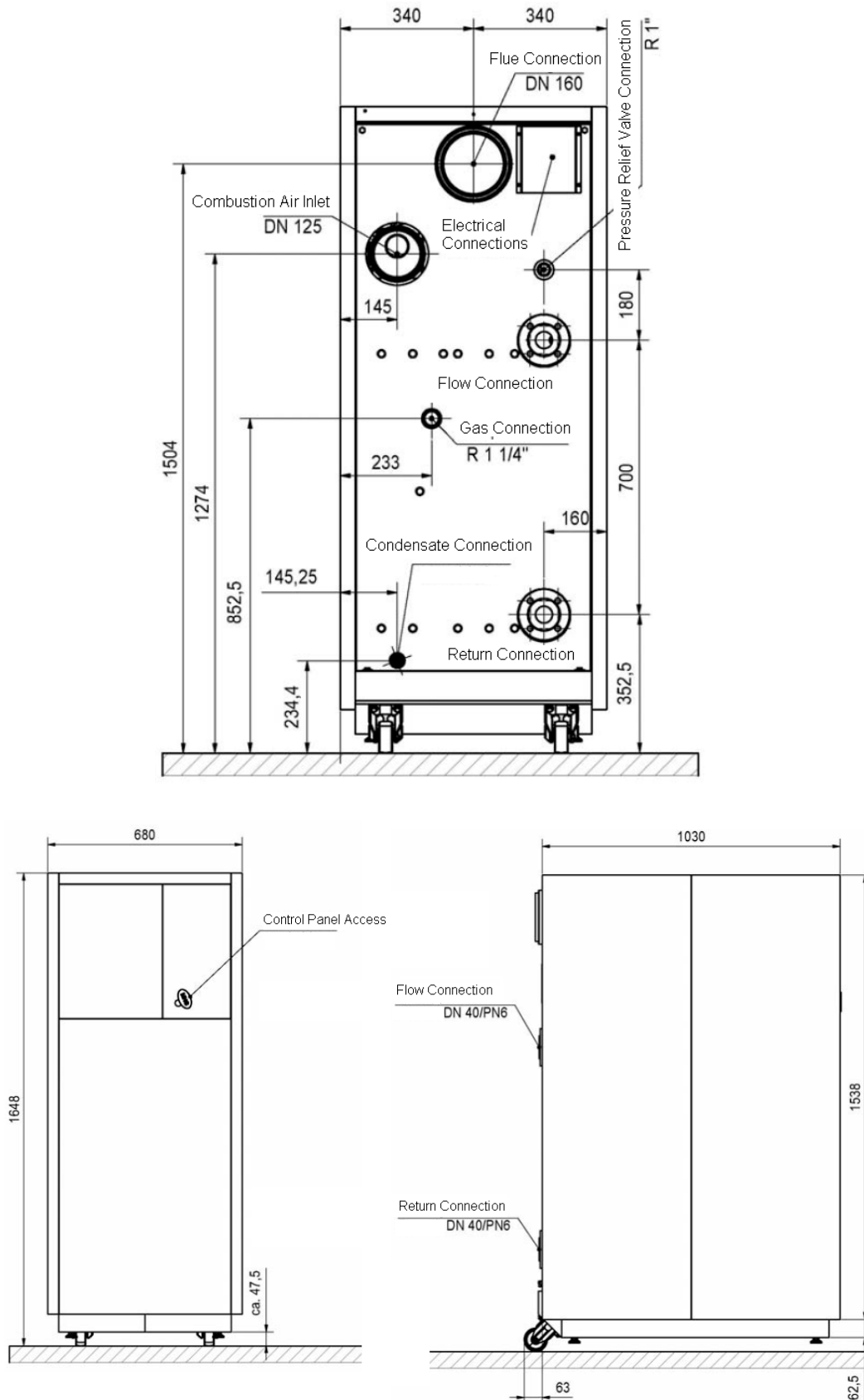
"The guarantee period shall begin on the day of commissioning, or at latest 3 months after delivery has been made.

The customer shall only be able to claim against MHG under guarantee if the commissioning of the object of delivery has been carried out by MHG staff or the authorised supplier, if the customer has followed MHG's instructions relating to the treatment and maintenance of the object of delivery, and if no replacement parts of outside origin have been fitted.

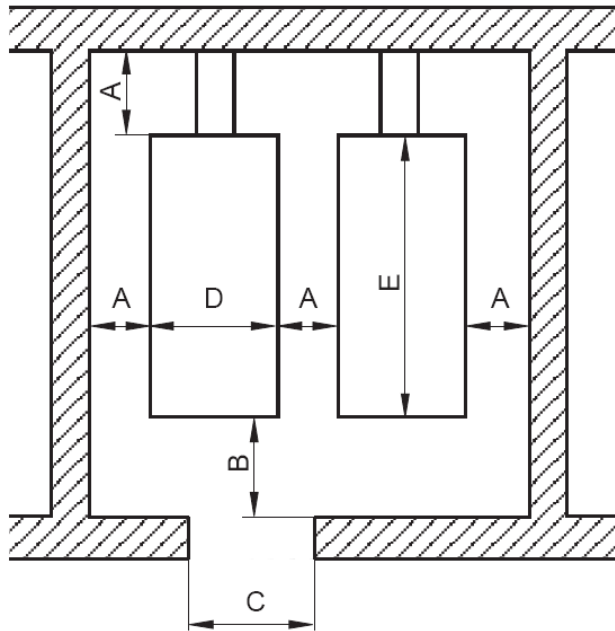
Parts subject to wear such as ignition electrodes, seals etc. are strictly excluded from the guarantee."

In addition to the above warranties, the Primary Heat Exchangers carry a 60 month guarantee against manufacturing or material defect.

3.0 Dimensions.



3.1 Installation / Service Clearances



Dimension	[Minimum mm Clearance]
A	500
B	1000
C	700
D	680
E	1050

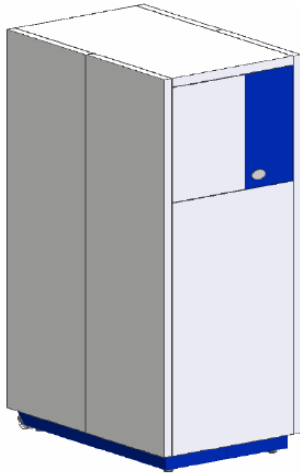
4.0 Delivery And Mobility.

Each ProCon HT boiler is supplied with a manoeuvring tool. This is to be used to facilitate the correct position of the unit.

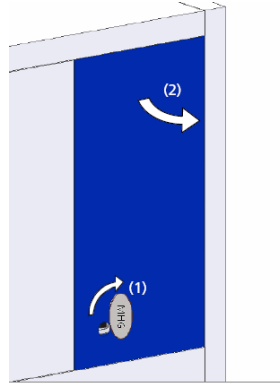


4.1 Case Removal

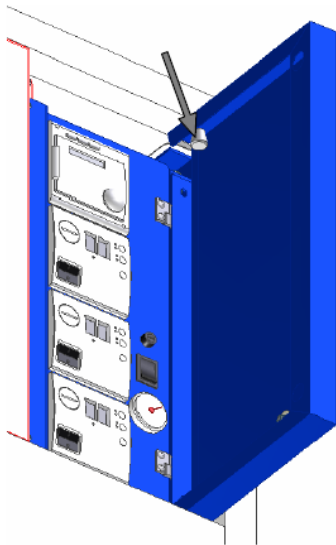
A 4.0mm Allen Key is required to initiate the removal of the appliances case.



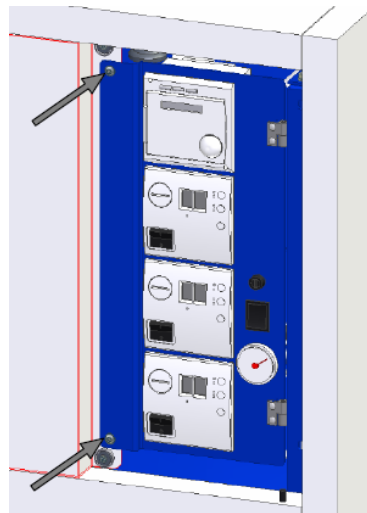
1. Case In Place



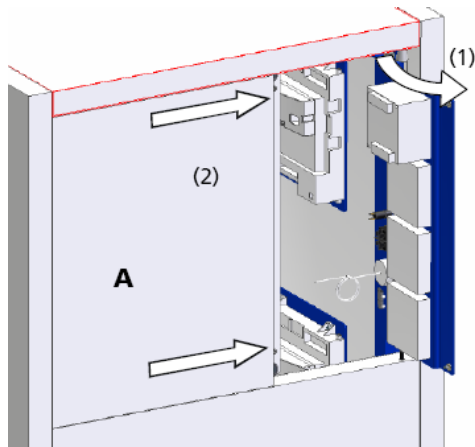
2. (1) Turn the MHG Logo, (2) insert Finger and open the cover to the right.



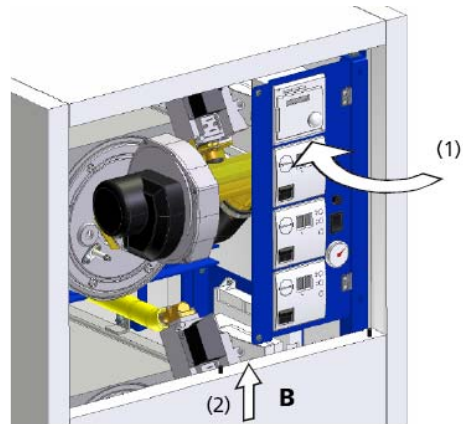
3. Locate the top sprung hinge pin and pull down to release the cover.



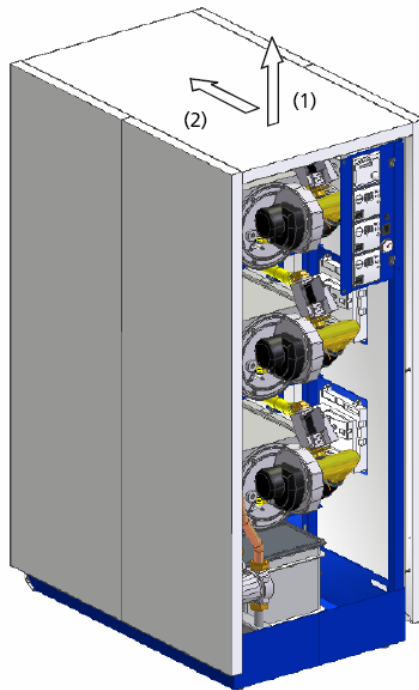
4. Using a 4mm Allen Key loosen the two captive bolts.



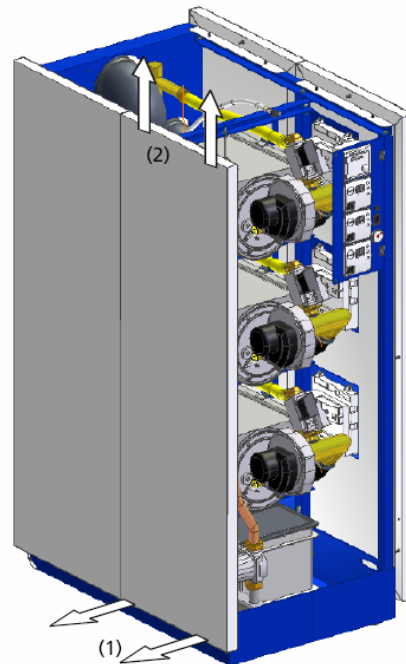
5. (1) Swing the Control Panel to the right
(2) Slide panel A to the right and remove.



6. (1) Swing the control panel back into its rest position, (2) slid panel B up and remove.



7. (1) Lift the top panel up, (2) push to the rear of the unit and remove.



8. (1) Pull the base of each side panel to disengage it from the press studs, (2) lift the panel clear of the top pins.

5.0 Technical Data

Technical Data			150	225
Nominal Heat Input Net	Min/Max	kW	15.0/149.2	15.0/216.0
Nominal Heat Output (50°C/30°C)	Min/Max	kW	16.0/155.0	16.0/225.0
Nominal Heat Output (80°C/60°C)	Min/Max	kW	14.5/143.2	14.5/206.0
Operating Efficiency (40°C/30°C)		%	109.5	109.5
Design Water Flow Rate		Ltr/sec	1.8	2.66
Residual Head from In-built Pumps (Cascade version only)		kPa	15.0	15.0
Maximum Input Gas Rate	G20	m³/hr	15.0	21.7
	G31	m³/hr	5.77	8.35
Gas Inlet Pressure	Min/Max	mbar	18.0/50.0	18.0/50.0
Maximum Flue Gas Mass	G20 (Hot)	Kg/hr	250.9	363.6
Maximum Flue Gas Mass	G31 (Hot)	Kg/hr	231.4	335.1
Residual Fan Pressure		Pa	200	200
Maximum Water Pressure	(Hot)	bar	3.0	3.0
Minimum Water Pressure	(Cold)	bar	1.0	1.0
Maximum Flow Temperature		°C	90	90
Power Supply (240 V /50 Hz)		Amps	7	7
Max Power Consumption		Watts	690	800
Water Content		Ltrs	30	35
Lift Weight (Dry)		kg	250	270
Lift Weight (Wet)		kg	280	305
Efficiency @ Full Load Gross		%	86.48	85.67
Efficiency @ 30% of Full Load Gross		%	98.20	98.37
NOx emission @ 0% O ₂		Mg/kWh	26.7 (Class 5)	
Flue Classification			B23, C33, C43, C53, C63, C83.	

Connections

HTG Primary Flow	PN6	DN 40	DN 40
HTG Primary Return	PN6	DN 40	DN 40
Gas	BSP	R1.25"	R1.25"
Flue Connection		DN 160	DN 160
Combustion Air Connection		DN 125	DN 125
The combustion air duct must have a resistance no greater than 100Pa			
Condensate Outlet	Plastic	20mm	20mm

Please note that the condensate disposal system must be installed in Plastic or Stainless Steel. (Copper is not acceptable.)

6.0 Pressure (Safety) Relief Valve

In accordance with BS 6644: 2005, the installer shall install as suitably sized Pressure (Safety) Relief Valve.

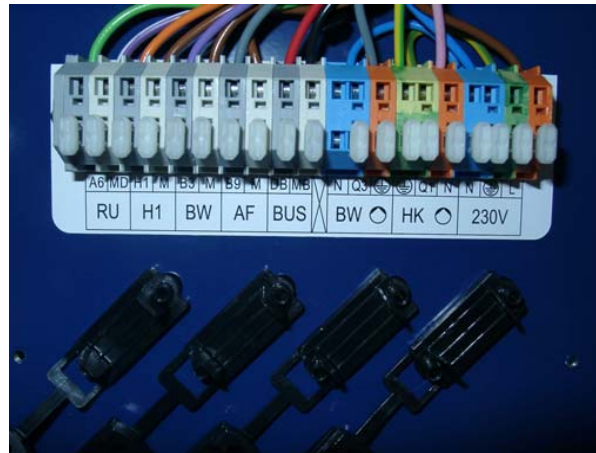
The location of this valve is important with respect to the applied pressure of the boiler circulation pump, it is therefore recommended to locate the Pressure (Safety) Relief Valve on the flow pipe immediately adjacent to the boiler; furthermore, there must not be any means of isolation between the boiler and the Pressure (Safety) Relief Valve.

7.0 Electrical Connections

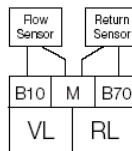
Basic electrical connection for all type of ProCon HT

A6	MD	H1	M	B3	M	B9	M	DB	MB		N	Q3	⊕	⊕	Q1	N	N	⊕	L
RU	H1	BW	AF	BUS		BW	⊕	HK	⊕	230V									

Terminal Rail located under cover plate at rear face of boiler - top l/h



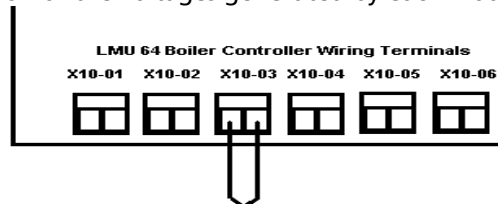
External Flow and return sensors (QAD21) are required for Cascade Manager Units only. The sensors must be wired to the terminal detailed below.



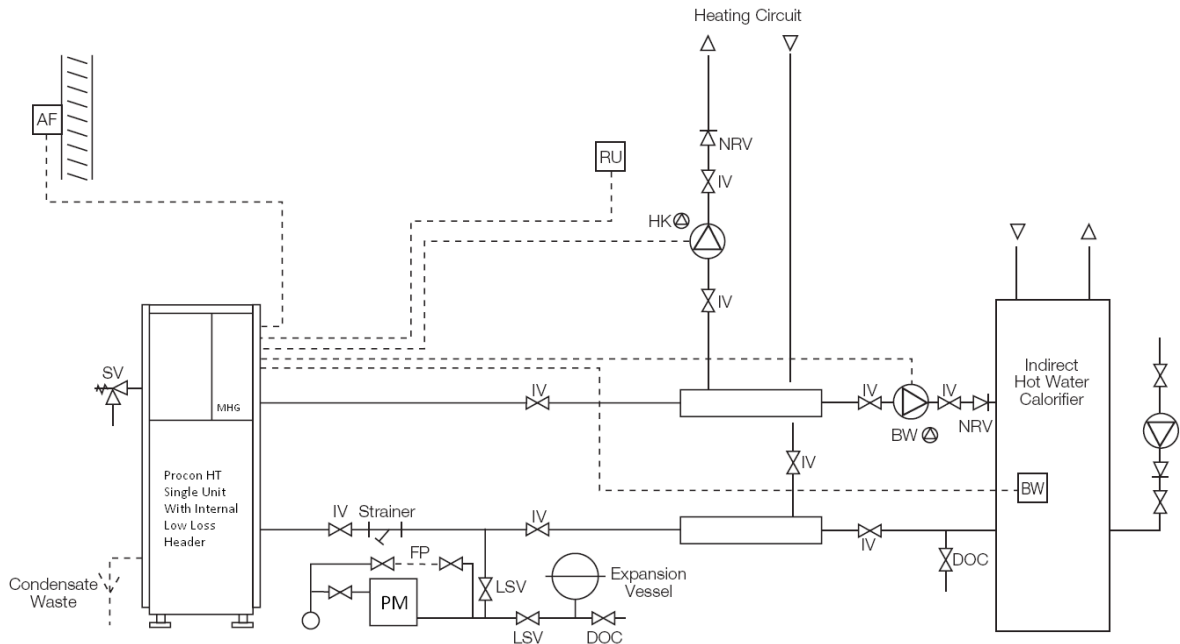
These terminals are located on the top left of the boiler frame when viewed from the front.
(These terminals are pre-wired on Standalone ProCon HT units.)

Module Controller Mounted Safety Interlock Terminals (X10:03) (Low Voltage<25V)

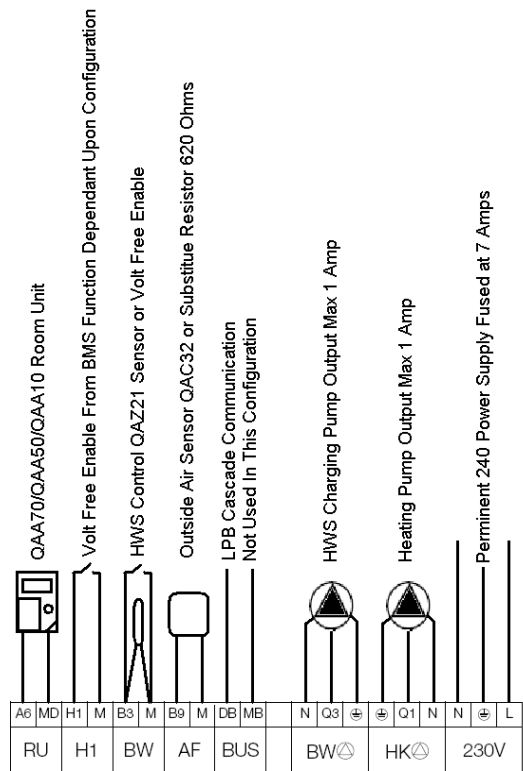
If required each module can be connected to an external safety device. A relay must be used to ensure separation of the voltages generated by each module controller. (X10:03)



8.0 Hydraulic Design Single Unit

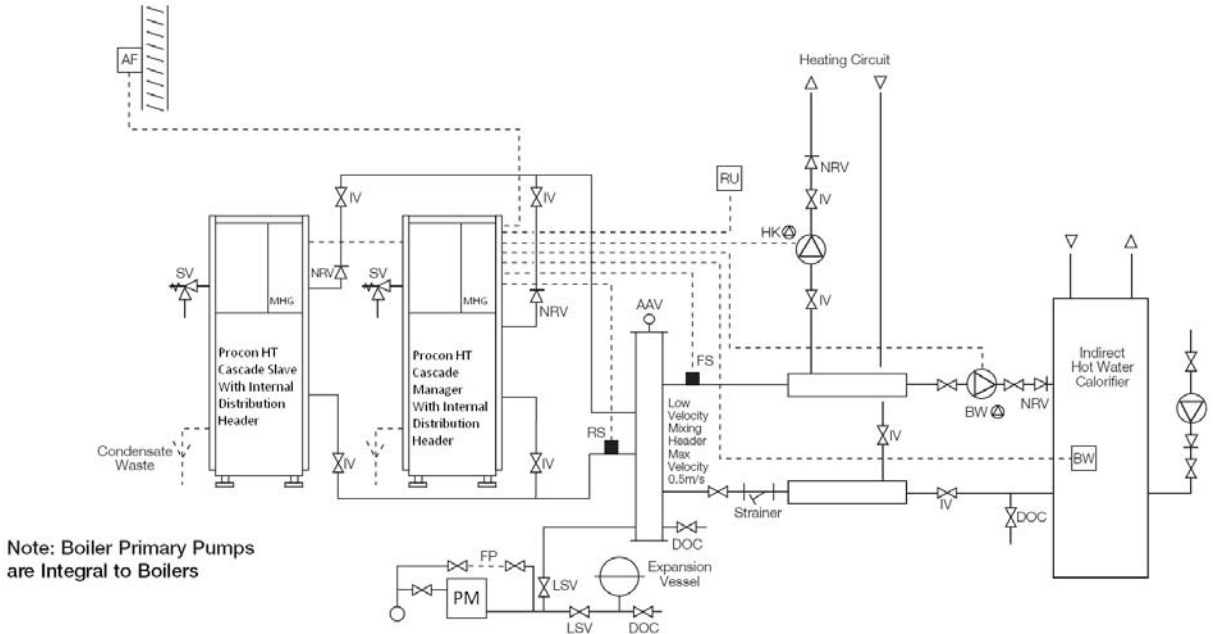


8.1 Electrical Connections Single Unit



If Direct On Boiler Weather Compensation is not required a 620 Ohm Resistor must be applied to the AF terminals to remove the E10 Error Code from the RVA47 Cascade Manager LPB Network.

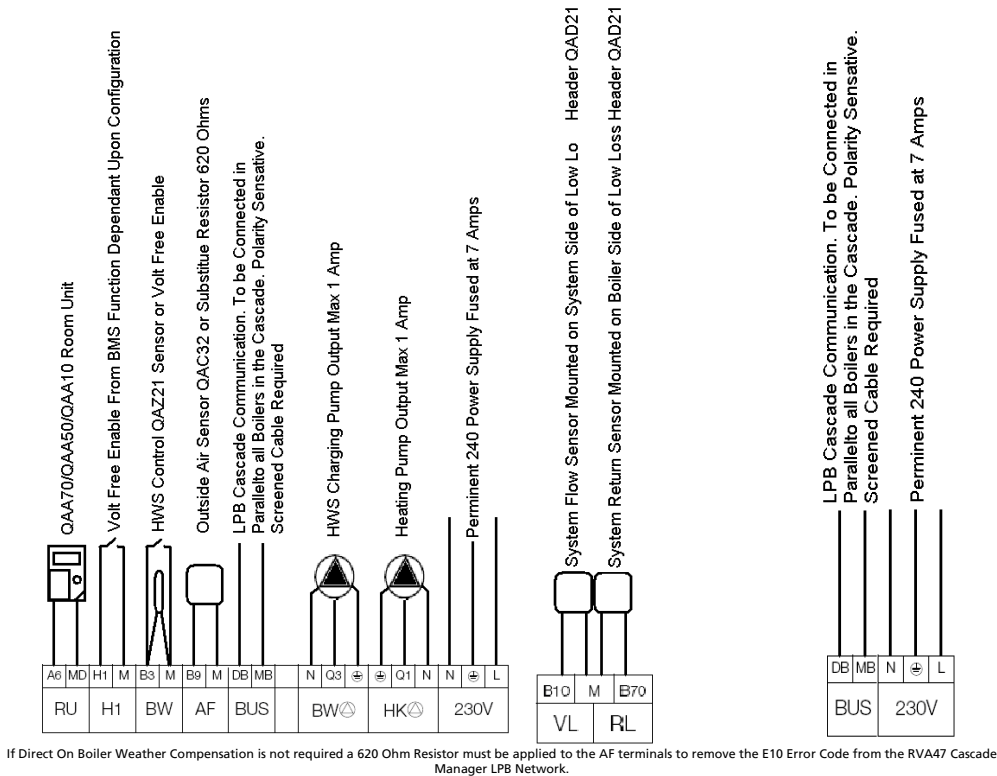
8.2 Hydraulic Design Cascade Units



Note: Boiler Primary Pumps are Integral to Boilers

- Legend
- | | | | |
|----|--|----|--------------------------|
| AF | Outside Air Sensor (QAC32) | HK | Heating Circuit Pump |
| BW | Hot Water Sensor(QAZ21) or VF Thermostat | PM | System Pressure Manager |
| BW | Hot Water Primary Pump | RU | Room Unit (QAA), BMS etc |
| FP | System Filling (Approved) | FS | Flow Sensor |
| RS | Return Sensor | | |

8.3 Electrical Connections Cascade Units



Master Unit Wiring

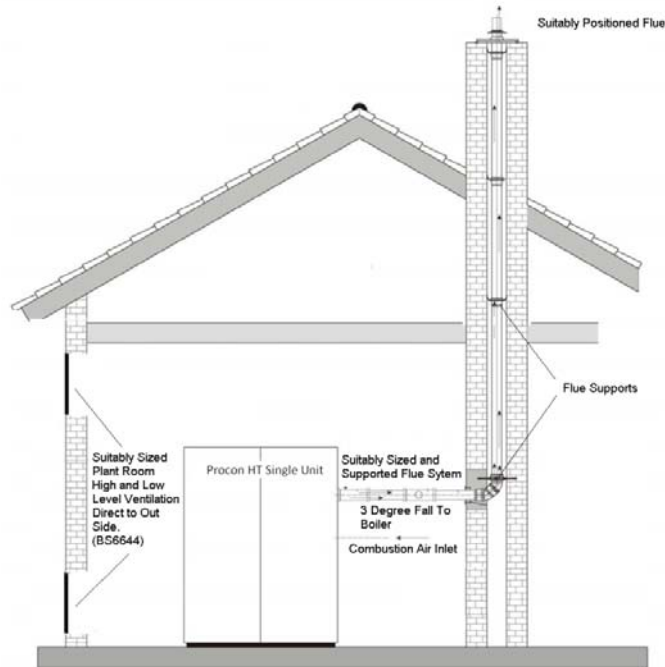
Slave Unit Wiring

9.0 Fluing Options

Please note that excessive resistance within the flue and combustion air supply systems will lead to a reduction in the output of the appliance and induce operation faults.

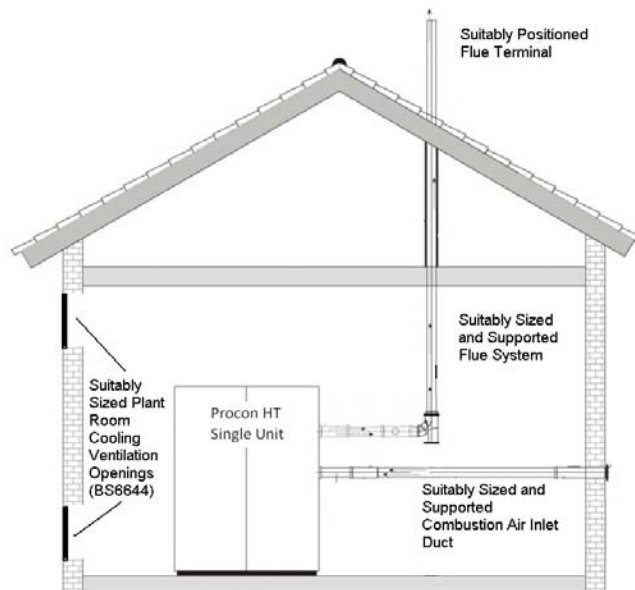
Boiler Type	Flue Outlet Size	Flue Size	Maximum Length Flue and Combustion Air Ducts Combined Max 100Pa for Combustion Air Duct
ProCon 150	DN 160	DN 160	28m
ProCon 225	DN 160	DN 160	23m

9.1 Single ProCon HT. Conventionally Flued.



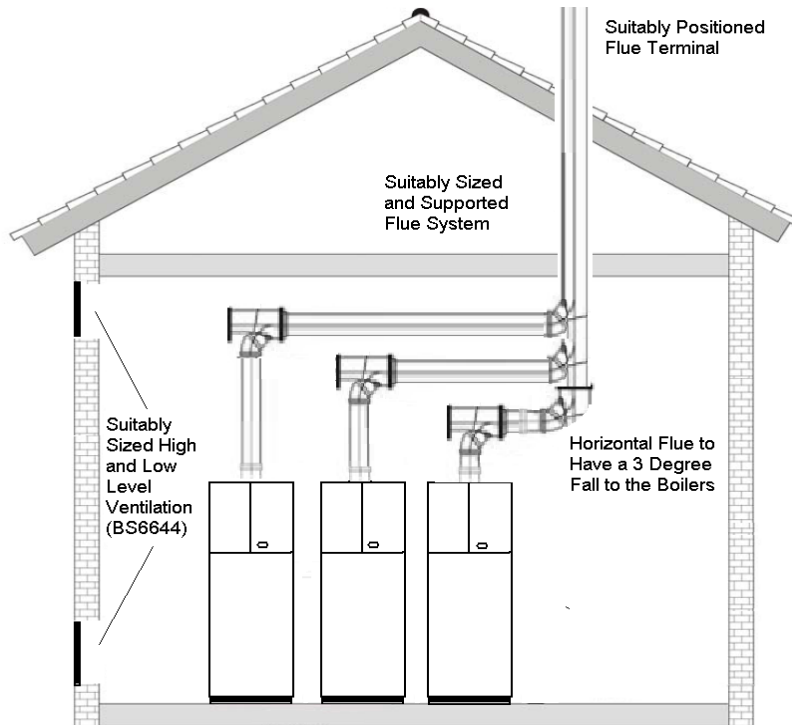
9.2 Single ProCon HT. Balanced Flued.

Please note: The combustion air duct must have a resistance no greater than 100Pa



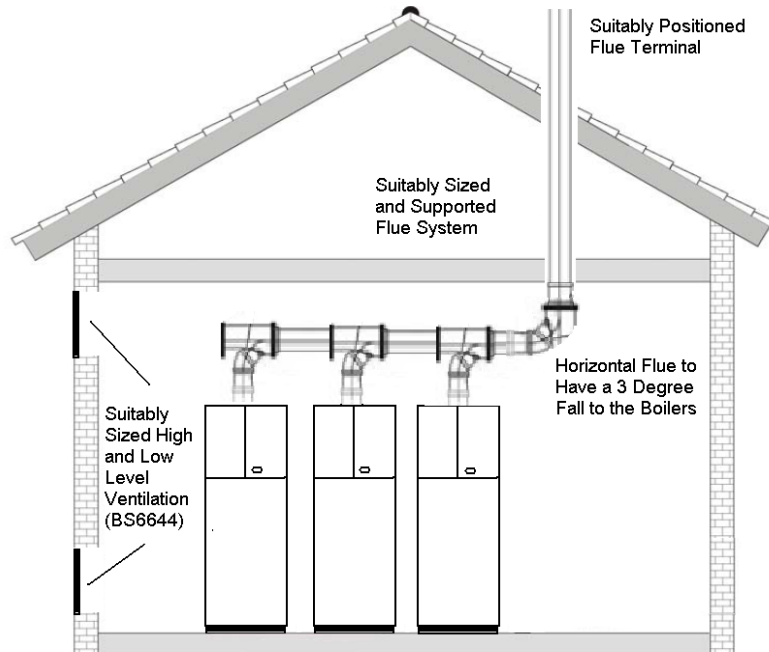
9.3 Multiple Cascade ProCon HT's. Conventionally Flued.

Preferred Method of Fluing Cascaded units



Conventional Flue Header Arrangement.

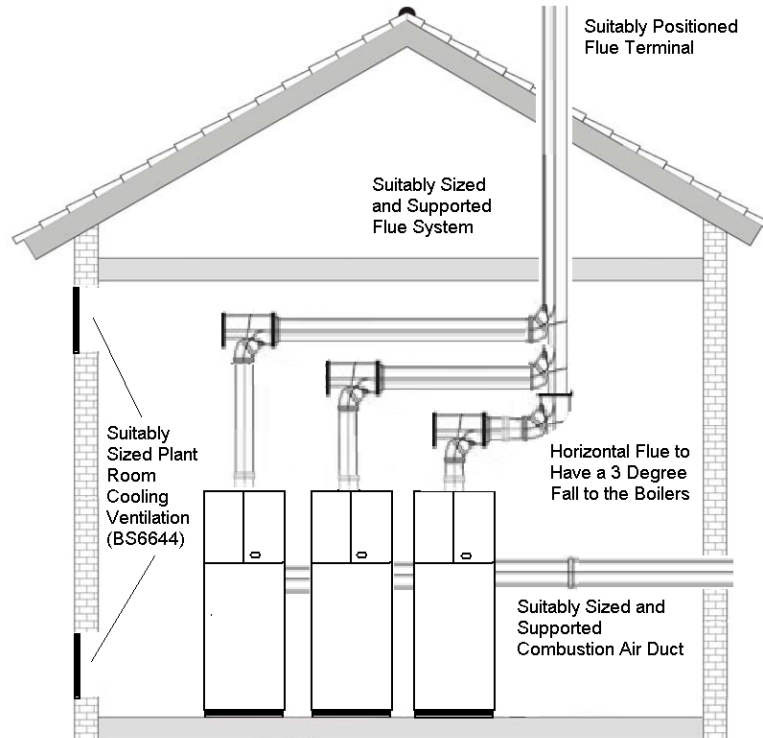
If this method is utilised the flue must be sized to prevent back pressure effecting other appliances on the flue system.



9.4 Multiple Cascade ProCon HT's. Balanced Flued.

Preferred Method of Fluing Cascaded units

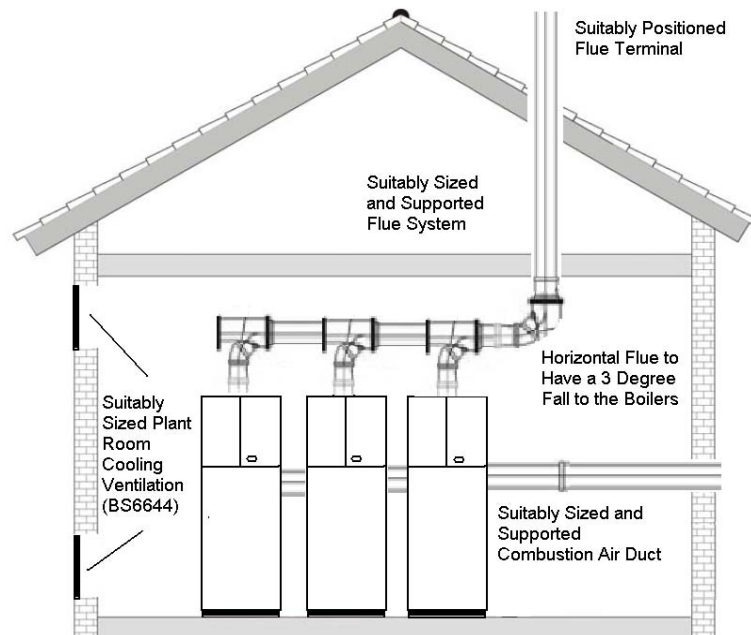
Please note: The combustion air duct must have a resistance no greater than 100Pa



Conventional Flue Header Arrangement.

If this method is utilised the flue must be sized to prevent back pressure effecting associated appliances.

Please note: The combustion air duct must have a resistance no greater than 100Pa



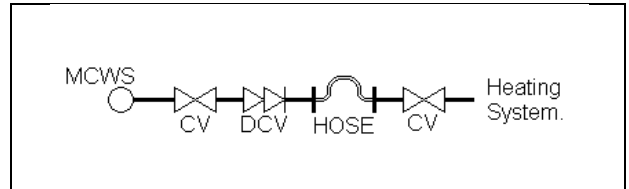
10.0 Filling The System

The Initial filling of a sealed heating system, and subsequent refilling, must be by a method that has been approved by the Water Regulation Advisory Scheme (WRAS) for that type of heating system.

i.e.	Domestic (<i>In-House</i>)	Fluid Category 3 (C-3)
	Non Domestic (Other than <i>In-House</i>)	Fluid Category 4 (C-4)

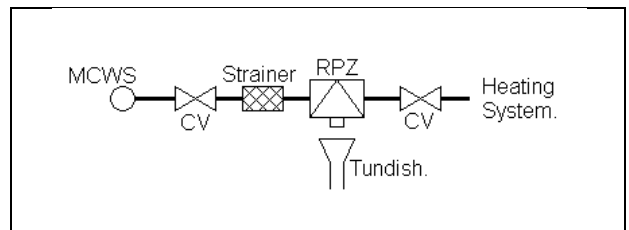
For Category 3 systems, the approved method of filling must comprise of the following components in the arrangement shown;

- Control Valve incorporating a Double Check Valve on the Mains Cold Water pipework.
- Temporary Connecting Hose, which must be disconnected after use.
- Control Valve, on the heating system.



For Category 4 systems, the approved method of filling must comprise of the following components in the arrangement shown;

- Control Valve.
- Strainer.
- Verifiable Backflow Device with Reduced Pressure Zone (RPZ Valve)
- Incorporating a 'Type BA' Air Gap.
- Tundish.
- Control Valve.



Further more, in accordance with BS 6644: 2005 system with an input greater than 70kW (nett), an automatic water replenishment unit shall be installed to automatically replenish any lost or evaporated water.

Please refer to BS 6644: 2005 for allowable water replenishment methods for use with sealed/pressurized heating systems.

For information on a comprehensive range of pressurization units that comply with current British Standards and WRAS Regulations, please contact MHG Heating Ltd Sales.

10.1 Expansion Vessel

In accordance with BS 6644: 2005, WRAS Regulations, and Local Authority Water Regulations, as applicable, the installer shall install a suitably sized, and approved, Expansion Vessel to ensure that the water capacity of the system has ample expansion capacity.

The location of the expansion vessel shall only be isolatable from the system via a Lockable Type Service Valve, which shall be locked in the *OPEN* position, to prevent accidental isolation.

Furthermore, a drain facility should be provided adjacent to the expansion vessel to aide the routine maintenance, overhaul, of the vessels Air Pressure setting.

For information on a comprehensive range of expansion vessels that comply with current British Standards and WRAS Regulations, please contact MHG Heating Ltd Sales.

11.0 System Water Quality

Water Treatment, System Cleaning (BS 7592: 2006)

The entire primary system MUST be thoroughly cleaned and flushed to remove debris, flux residues, etc. before opening the boiler isolation valves & flooding the boiler. Particular care must be taken where the ProCon boiler is being retro-fitted into an old/existing system, as system silt or magnetite can be very damaging to the new boiler. Following cleaning and flushing the system MUST be dosed with a good quality water treatment to prevent corrosion and the formation of scale. FAILURE TO OBSERVE THESE REQUIREMENTS WILL RENDER THE WARRANTY ON THE APPLIANCE VOID.

Cleaning, flushing and water treatment must be carried out in accordance with the requirements of BS 7593:1992, prior to commissioning the boiler.

Repeated draining and refilling of the system, without replenishment of water treatment, must be avoided, as this is very damaging to the boiler. The boiler must not operate without the system water being correctly and adequately treated, and maintained, with an appropriate level of corrosion inhibitor.

For specific guidance on water treatment, direct contact is advisable with:-

Betz Dearborn Limited
(Sentiel)
Foundry Lane
Widnes
Cheshire
WA8 8UD
Tel: 0151 424 5351
Fax: 0151 420 5447

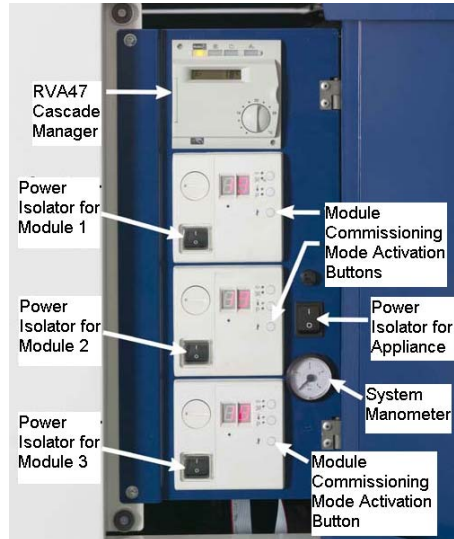
Alpha-Fry Technologies
(Ferrox)
Cookson Electronics
Forsyth Road
Sheerwater
Woking
Surrey
GU21 5RZ
Tel: 0208 665 6666
Fax: 0208 665 4695

11.1 Care With The Use of Solder Flux

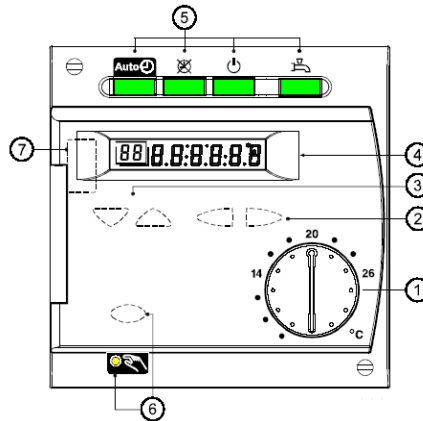
The ProCon HT range has heat exchangers fabricated from 316L Stainless Steel. It is most important that the compatibility of any flux is checked with the supplier before use, and that any flux manufacturers recommendations are strictly followed with regards to use in conjunction with Stainless Steel.

12.0 Appliance Controls

12.1 Control Panel



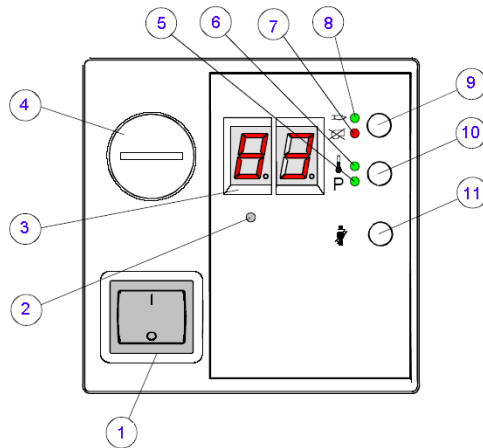
12.2 RVA47 Cascade Manager



Legend

1. Room Temperature Set Point Adjuster. Assumed Room Temperature if no Room Unit Fitted
2. Parameter Setting Buttons - / +
3. Parameter Line Selection Buttons Down / Up
4. Display Screen
5. Mode Selection Buttons. Operating Mode Indication
 - Automatic Operation
 - Continuous Operation On / Off
 - Standby
 - HWS On / Off
6. Manual Override Button and Indicator
 - Manual Operation On / Off
7. Computer Access Port

12.3 Module Controller



Legend

1. Module Power Isolator
2. Infrared Output to Flue Gas Analyser Optional Extra.
3. Module Numerical Indicator
4. Temporary Connection Port For QAA73 for LMU 64 Configuration.
5. Indication of System Pressure **P** (Not Used)
6. Indication of Module Over Temperature
7. Indication of Module Lockout
8. Indication of Module Burner Activation
9. Module Lockout Reset Button (To be pressed for at least 3 Seconds)
10. Display Alteration Button
11. Commissioning Mode Activation Button

12.4 Module Controller End User Settings.

The Module Controller provides access to the End User adjustable parameters P parameters along with other operational information only settings A, B, C & D parameters.

End User Adjustable Parameters. (Default = Recommended Settings)

Parameter	Function	Range	Default
P0			
P1	Required Module Flow Temperature / Room Temperature. (Outside air sensor attachment dependant. Without = Flow Temperature)	20-90°C / 10-30°C	85 / 20°C
P2	Required HWS Set Point. (Only Used if the Module is Directly Controlling HWS Generation)	10-80°C	60°C
P3	Not used in This Configuration	NA	NA
P4	Not used in This Configuration	NA	NA
P5	Weather Compensation Curve Heating Circuit 1	-- / 40	32
P6	Weather Compensation Curve Parallel Displacement	-31 / +31	0

12.5 Accessing Module Parameters

1. Press the display mode button (10) to choose display level «P» (keep button depressed).
2. Press the display mode button (10) to choose the required parameter (press button briefly).
3. Adjust the value:

Changing parameters: (only P0...P6)

Only parameters P0...P6 can be changed.

To do this, wait until the value of the parameter flashes on the display (3).

Proceed as follows:



P 0 (+) or (Enter) Increase value (+): Press display mode button (10) briefly several times (< 1 second)



1 (-) Decrease value (-): Press chimney sweep button (11) briefly several times (< 3 seconds)



P 0 (+) or (Enter) Save value (Enter): Press display mode button (10) for **at least 3** seconds

If the displayed value does not require amending or the altered setting is not required do not press any buttons on the controller for a period greater than 12 seconds.

As a confirmation, the display (3) shows P0...P6 in consecutive order and the newly adjusted value.

The new value will only be adopted **after storage**.

Reviewing the Parameter Values

To query the different parameter values, proceed as follows:

Choosing the display mode

Choose the display mode by pressing button (10) for **more than 3 seconds** (display (3): A...). **Keep button (10) depressed** to reach the different display levels b, C, d, P and back to A.

Release the button when the required display level is reached (A, b, C, d, P).

Choosing and displaying individual values or parameters

To change between the different values or parameters (0... max. 7) of the different display

levels (A, b, C, d, P), **press button (10) briefly**.

The current value appears about 2 seconds after choosing the relevant parameter.

12.6 Module Operating Codes

			LED ¹⁾	
Display level	Name of LMU... variable	Description	 6	 5
General information (enduser level) ²⁾				
A 0	Meldecode	Diagnostic code (system)	*	* ³⁾
A 1	Tk1st	Boiler temperature (flow)	●	○
A 2	Tbw1st1	D.h.w. temperature sensor 1	*	○
A 3	Druck	Water or air pressure	○	●
A 4	Betr.Phase	Operating phase of burner control	○	○
A5	TiAussen	Outside temperature (only AGU2.310...)	○	○
Temperatures (service level)				
b 0	DiagnoseCode	LMU...-internal software diagnostic code	*	* ³⁾
b 1	TkRuec	Boiler return temperature	●	●
b 2	Tbw1st2	D.h.w. temperature sensor 2	●	●
b 3	Tabgas	Flue gas temperature	●	●
b 4	TiAussen	Outside temperature	●	●
b 5	TaGem	Composite outside temperature	●	●
b 6	TaGed	Attenuated outside temperature	●	●
b 7	Tv1st	Flow temperature AGU2.500...	●	●
Process values (service level)				
C 1	IonStrom	Ionization current	●	●
C 2	Geb1_Drehz	Fan speed	●	●
C 3	Geb1_PWM_AusAkt	Current fan control (PWM)	●	●
C 4	RelModLevel	Relative output	●	●
C 5	Pumpe_PWM	Pump setpoint (PWM)	●	●
C 6	ek0	Control differential	●	●
Setpoints (service level)				
d 1	Tsoll	Setpoint of 2-position or modulating controller (PID)	●	●
d 2	TkSoll	Current boiler temperature setpoint	●	●
d 3	TsRaum	Room temperature setpoint	●	●
d 4	TbwSoll	D.h.w. temperature setpoint	●	●
d 5	PhzMax	Maximum degree of modulation in heating mode	●	●
d 6	NhzMax	Maximum speed at maximum output in heating mode	●	●
Parameters (service level) (Prog Mode) (setting only with special functions or 4) – not with AGU2.310...				
P 0	PhzRelMmi	Start output controller stop (only in operating mode without the appropriate setpoint potentiometer, otherwise locked)	●	*
P 1	Tr/TvSollMmi	Room / flow temperature setpoint (only in operating mode without the appropriate setpoint potentiometer, otherwise locked)	●	*
P 2	TbwSollMmi	D.h.w. setpoint (only in operating mode without the appropriate setpoint potentiometer, otherwise locked)	●	*
P 3	reserviert	Reserved	●	*
P 4	NqmodMin	Minimum pump speed	●	*
P 5	Sth1	Slope HC1	●	*
P 6	DTR1	Parallel displacement HC1	●	*

1) LED: * = flashing, ● = lit, ○ = dark

2) The parameters of group «A» can also be selected by briefly pressing the button for the display mode

3) Indication flashes alternately

4) Setting the heating curve when using the heating circuit module AGU...

Note: After about 8 minutes, the display will automatically change to the boiler temperature «A1»

13.0 Appliance Error Codes

If a fault is encountered within the appliance or Cascade LPB network, a fault code will be generated and displayed by the failing module and all LPB networked RVA47 Cascade Managers.

If a fault is encountered by a module the respective code will be displayed along with a flashing LED. Three digit codes will be displayed in two consecutive sections. I.e. 1-53 = 153.

If a fault is encountered by a RVA47 Cascade Manager or communicated to a RVA47 Cascade Manager via the LPB network ER will be generated on the display.

Opening the controllers flap and pressing the Down PROG button twice will gain access to parameter line 50 where the generated fault code can be reviewed.

In either case the fault code should be noted for future reference.

If the fault is related to a specific module the unit can be reset by pressing the Lockout Reset Button (9) for at least 3 seconds.

If the fault is related to a RVA47 Cascade Manager or the LPB communication network the fault code will clear automatically following the rectification of the fault.

This is also applicable following the rectification of any module fault. This can take up to 10 minutes.

Fault Code	Description
E-0	No Error Detected
E-10	Outside Air Sensor Fault / Not Detected
E-20	Flow Water Sensor Fault / Not Detected
E-26	System Flow Sensor Faulty / Not Detected
E-28	Flue Gas Sensor Fault / Not Detected
E-40	Return Water Sensor Fault / Not Detected
E-46	System Return Water Sensor Fault / Not Detected
E-50	HWS Sensor Short Circuit 1
E-52	HWS Sensor Short Circuit 2 (Not Used)
E-58	HWS Volt Free Switch Fault / Not Detected
E-60	Faulty Room Sensor
E-61	Faulty Room Sensor
E-62	Incorrect Room Unit Connected
E-77	Air Pressure Sensor Not Detected (Not Used)
E-78	Water Pressure Sensor Defective (Not Used)
E-81	LPB Short Circuit (Boiler Cascade Wiring)
E-82	LPB Address Conflict (Boiler Cascade Settings)
E-86	Short Circuit on PPS Connection (Not Used in ProCon Configuration)
E-91	EEPROM
E-92	Hardware Malfunction
E-100	Conflict Between Time of Day Master Control (Boiler / QAA70 / RVA47)
E-105	Annual Service of Unit is Due. (QAA73 Service Tool Required to reset timer See Section 16.0)
E-110	Module Water Temperature Overheat
E-111	Module Temperature Too High (Auto Resetting)
E-113	Flue Gas Temperature overheat (Not Used)
E-117	High System Water Pressure Sensor (Not Used)
E-118	Low System Water Pressure Sensor (Not Used)
E-119	System Water Pressure Switch Activated (Below 0.8 bar)
E-124	Module Temperature Too High (Auto Resetting)
E-128	Flame Extinguished During Operation (LMU Version D)

E-129	Air Supply Error. Fan not operating at correct speed (LMU Version D)
E-130	Flue Temperature Too High (Auto Resetting)
E-131	Fault With Burner
E-132	External Safety Interlock Activated (Open Circuit)
E-133	No Flame Detected After Final Ignition Attempt
E-134	Flame Extinguished During Operation (LMU Version C)
E-135	Air Supply Error Fan not operating at correct speed (LMU Version C)
E-140	LPB Segment / Address Not Recognized (Boiler Cascade Settings)
E-142	LPB Missing Partner (Boiler Cascade Settings)
E-145	Wrong Device Connected to PPS Circuit (Not Used in ProCon Configuration)
E-146	Unrecognized Plant Configuration
E-147	Burner Modules Not Connected (PPS Circuit Not Used in ProCon Configuration)
E-148	LPB Interface Not Configured (Boiler Cascade Settings)
E-150	General Boiler Fault
E-151	Module LMU64 Controller Malfunction
E-152	Module LMU64 Controller Parameter Programming Error
E-153	Module Control Interlocked
E-154	Module Operating Outside of Predefined Parameters. (System Hydraulic Error.)
E-160	Fan Not Reaching Set Point
E-161	Module Combustion Fan Speed Too High
E-162	Air Pressure Switch Fault (Not Used)
E-164	Flow Switch / Pressure Switch Open (Not Used)
E-166	Air Pressure Switch Fault (Not Used)
E-180	Module Operating in Chimney Mode 100% Output
E-181	Module Operating in Commissioning Mode
E-183	Module Controller / QAA73 Room Unit in Parameter Setting Mode

14.0 Control Parameter Default Settings.

14.1 RVA47 Cascade Manager Settings.

The Single and Cascade Master units are preset for correct operation.

The following Pages detail the parameters of the RVA47 Cascade Manager and the Standard Factory settings, please note, the installer/commissioning engineer may have changed some of these settings to suit the system installed.

There are two levels of access available, as follows. If you cannot access a particular parameter line, please consult with MHG's Technical Department for further assistance.

Level One (End User)	- Open The Hinged Flap. Use either of the ▽△ Program Buttons to access the desired parameter line. (Parameter Line range 0-50) Use the ◀▶ Buttons to alter the required parameter. Once all alterations have been completed press the AUTO button to exist this level.
Level Two (Installer)	- Open The Hinged Flap. Press & Hold the ▽△ Program Buttons simultaneously for more than 3 seconds until Parameter # 51 appears. Use either of the ▽△ Program Buttons to access the desired parameter line. (Parameter Line range 51-173) Use the ◀▶ Buttons to alter the required parameter. Once all alterations have been completed press the AUTO button to exist this level.
Level Three (OEM)	- Open The Hinged Flap. Press & Hold the ▽△ Program Buttons simultaneously for up to 9 seconds until - - - - appears. A password will be required to access this level. (Down Down Plus Minus Plus) Use either of the ▽△ Program Buttons to access the desired parameter line. (Parameter Line range 2-92) Use the ◀▶ Buttons to alter the required parameter. Once all alterations have been completed press the AUTO button to exist this level.

Complete RVA47 Cascade Controller Parameter Settings.

The defaults indicated on the following pages are for standard systems.
If additional control features are required alteration will have to be made.
Please refer to the RVA47 manual for additional details.

#, -, ---	Indicates where an input can be made if required.
--	Indicates where an input can not be made and a sensed / attenuated figure is displayed. 'OFF' will be displayed if the +/- buttons are used.

[#]	Description	Range	150 & 225 Single	150 & 225 Cascade Master
End User Level				
1	Time of Day	00:00-24:00	As Required	As Required
2	Weekday	1-7	As Required	As Required
3	Date	00:00	As Required	As Required
4	Year	1900-3000	As Required	As Required
5	Day of Week	1.7 1.5 6.7 1-7	As Required	As Required
6	Heating Time Switch 1st On Time	00:00-24:00	06:00	06:00
7	Heating Time Switch 1st Off Time	00:00-24:00	22:00	22:00
8	Heating Time Switch 2nd On Time	00:00-24:00	-	-
9	Heating Time Switch 2nd Off Time	00:00-24:00	-	-
10	Heating Time Switch 3rd On Time	00:00-24:00	-	-
11	Heating Time Switch 3rd Off Time	00:00-24:00	-	-
13	Required HWS Temperature	40-60	55	55
14	Heating Night Setback Temperature	10-30	16	16
15	Frost Protect Temperature	4-15	10	10
16	Summer/Winter Changeover Temperature	8-30	30	30
17	Weather Compensation Curve. If a 0-10 volt signal is the required heat generation control method for the RVA47 / boiler installation this setting must be adjusted to -- on all RVA47s present in the boiler cascade installation. This will result in the Auto, On/Off and Frost lights becoming inactive. Alteration to parameter #170 and #172 will also be required.	0-40	32	32
18	Actual Room Temperature	0-50	--	--
19	Actual Outside Temperature (Pressing the + & - buttons simultaneously until the display stops flashing will reset the averaged value.)	-50+50	--	--
23	Restore User Level Factory Presets	0-1	0	0
30	Hot Water Time Switch 1st On Time	00:00-24:00	06:00	06:00
31	Hot Water Time Switch 1st Off Time	00:00-24:00	22:00	22:00
32	Hot Water Time Switch 2nd On Time	00:00-24:00	-	-
33	Hot Water Time Switch 2nd Off Time	00:00-24:00	-	-
34	Hot Water Time Switch 3rd On Time	00:00-24:00	-	-
35	Hot Water Time Switch 3rd Off Time	00:00-24:00	-	-
50	Fault Code Display	0-255	--	--
Engineer Level				
51	Output Test 0. Automatic control 1. All outputs off 2. HWS pump/valve on 3. Circulating pump on	0-3	0	0
52	Input Test 0. Return Temperature 1. HWS Temperature 2. Flow Temperature 3. Outside Temperature 4. Room Temperature 5. 0-10 Volt Required Temperature	0-5	0	0
53	Plant Type	0-100	--	--
56	Actual System Flow Temperature	0-140	--	--
57	Actual System Return Temperature	0-140	--	--
59	Actual System HWS Temperature	0-140	--	--
60	Attenuated Outside Air Temperature	-50+50	--	--
61	Composite Outside Air Temperature	-50+50	--	--
62	Outside Air Temperature Source	00.01/14.16	--	--
66	Maximum System Flow Temperature	8-85	--	--
69	Maximum HWS Temperature	8-85	--	--
70	Nominal Room Temperature Set Point	0.0-35.0	--	--
71	Set Point Of Room Temperature	0.0-35.0	--	--

#]	Description	Range	150 & 225 Single	150 & 225 Cascade Master
72	System Flow Temperature Set Point	0-140	--	--
75	Modules Available in Cascade	00.1/16.3	--	--
76	Lead Module in Cascade	00.1/16.3	--	--
77	Hour of Operation Until Sequence Change	0.990	--	--
95	Heating Pump Output (HKP) Output Functions	1-5	1	1
100	Displacement Of Weather Compensation Curve	-4.5 - +4.5	0	0
101	Gain Factor/Room Influence 0. Active 1. Inactive	0-1	1	1
102	Room Temperature Switching Differential	---/0.5-4	---	---
103	Minimum System Flow Temperature	8-95	8	8
104	Maximum System Flow Temperature	8-95	82	82
105	Building Construction Type 0. Heavy 1. Light	0-1	1	1
106	Adaptation of Heat Curve 0. Inactive 1. Active	0-1	0	0
107	Optimum Start Time Maximum Forward Shift. 00:00 Inactive	00:00-06:00	00:00	00:00
108	Optimum Stop Time Maximum Forward Shift 00:00 Inactive	00:00-06:00	00:00	00:00
109	Heating Zone Quick Setback Constant	0-20	2	2
110	Over Heat Protection Heating Zone Pump	0-1	0	0
117	Legionella Protection Function 0. Off. 1. On	0-1	0	0
118	Legionelle Protection Temperature	8-95	65	65
119	HWS Pump Operation Function. (Stored > Flow Temp) 0. Off 1. Always On 2. Only On When Boiler is Interlocked Off Via 170=3	0-2	0	0
120	Reduced HWS Temperature Set Point	8-70	40	40
121	HWS Time Control 0. 24 Hours per Day 1. As Heating Time Switch Settings 2. As HWS Time Switch Settings	0-2	2	2
122	HWS Pump Control 0. Heating Time Switch Setting Apply 1. HWS Time Switch Settings Apply	0-1	1	1
123	HWS Control in Cascade System 0. Controlled Via Master RVA47 Manager 1. Controlled Via All RVA47 Managers in Segment 2. Controlled Via All RVA47 Managers In LPB System	0-2	2	2
124	HWS Charging Cycles Per 24 Hour Period 0. One Per Day with 2.5 Hour Forward Shift from Heating Time Switch Setting 1. Several Per Day with 1 Hour Forwarding Shifting from Heating Time Switch Setting	0-1	1	1
125	HWS Temperature Control 0. QAZ21 Sensor 1. Volt Free Enable via Thermostat	0-1	0	0
126	System Flow Temperature Boost When HWS Enabled	0-30	20	20
127	HWS Priority / Shifting 0. Absolute Priority 1. Shifting Priority. Heating Reduced to Increase HWS Recovery 2. No Priority. HWS and Heating Operate in parallel 3. Shifting / Absolute Heating Switched OFF, Mixing Circuit Decreased (RVA46) to Increase HWS Recovery.	0-3	1	1
130	Hours Of Operation Prior to Sequence Rotation	10-990	10	10

#]	Description	Range	150 & 225 Single	150 & 225 Cascade Master
131	Changeover Sequence Program 0. No Exemptions 1. The First Module is Exempt 2. The Last Module is Exempt 3. The First and Last Modules are Exempt	0-3	0	0
132	Module Designated as Fixed Lead Unit	00.1-16.3	---	---
133	Cascade Enable Delay Time	1-120	1	1
134	Anti Cycling Time (Seconds)	0-1800	30	30
140	LPB Control Address 1. Master RVA47 Manager 2....16. Slave RVA47s Operating From Master RVA47 Manager	0-16	1	1
141	LPB Control Segment 0. Heat Generating Units (RVA47s) 1...14. Heat Consuming Units (RVA46s)	0-14	0	0
142	LPB Power Supply 0. Off 1. On	0-1	1	1
143	Operation of LPB Power Supply	On/Off	On	On
144	Display of LPB Communication	On/Off	On	On
145	Changeover Via LPB Connection 0. All Controllers in Same Segment 1. All Controllers in LPB System	0-1	1	1
146	Summer/Winter Changeover Via LPB 0. Local Control Only 1. Entire Control Via LPB	0-1	0	0
147	Central Standby Switching 0. Deactivated 1. Activated	0-1	0	0
148	Clock Mode 0. Autonomous All Clocks Can Have Different Times 1. System Time Without Adjustment 2. System Time With Adjustment 3. System Clock Master. There Can Only be One Master	0-3	2	2
149	Auto Time Adjustment Spring Date and Month of Last Sunday in March	Date/Month	25.03	25.03
150	Auto Time Adjustment Autumn Date and Month of Last Sunday in October	Date/Month	25.10	25.10
170	Operation of H1 Terminal 0. Changeover of Operation When Volt Free Switch is Made. (HWS Stopped) 1. Changeover of Operation When Volt Free Switch is Made. (HWS Unaffected) 2. Minimum Flow Temperature Maintained When Volt Free Switch is Made. (Set at 171.) 3. Heat Generation Stopped When Volt Free Switch is Made.(Frost Active) 4. 0-10 Volt Control to Vary System Flow Temperature. (Curve set at 172) (Terminal #1. 0-10 volt. Terminal #2. Ground.) {If a 0-10 volt signal is the required heat generation control method for the RVA47 / boiler installation this setting must be adjusted to 4. Alterations must also be made to parameter #17. The setting must be adjusted from 32 to – on all RVA47s present in the boiler cascade installation. This will result in the Auto, On/Off and Frost lights becoming inactive. Possible alterations to parameter #172 may also be required.}	0-4	0	0
171	Minimum Temperature Set Point Via H1 (170 = 2)	8-95	80	80

[#]	Description	Range	150 & 225 Single	150 & 225 Cascade Master
172	Maximum Temperature Set Point Via H1 (170 = 4)	5-130	82	82
173	Operating Action of H1 control contacts. 0. The contact is Normally Closed. 1. The contact is Normally Open. {The RVA47 will operate according to its internal time switches and presets. If a remote BMS is controlling the RVA47 via a Volt Free switch across H1 '0' should be inserted. This will allow the boilers operate when the Volt Free switch is made and stopped (Blocked.) when the switch is opened. If you are controlling the lead (master) RVA/Boiler via a volt free switch across H1, all slave modules should be left with '1' as the input. This will allow the AUTO light and the OFF light to indicate their operational mode dictated by the lead (master) RVA/Boiler.}	0-1	1	1
	OEM Level			
2	Maximum Module Temperature When Operating In Manual Mode	8-120	82	82
8	Pump Run On Time System Heating (HKP) and HWS (SLP) Pumps	0-20	3	3
22	Minimum System Return Temperature	8-95	8	8
30	Room Influence Gain Factor	0-20	4	4
32	Boost Room Temperature Set Point Room Sensor Dependant (QAA10/50/70) Increase. Heat Up Time Reduced Decrease Heat Up Time Increased	0-20	5	5
33	Frost Protection 0. Frost Protection Program Disabled 1. Frost Protection Program Enabled	0-1	1	1
35	Heat Gains Increase. If Heat Gains are High Decrease. If Heat Gains are Low	-2-+4	0	0
36	Adaptation Sensitivity 1 Outside Air Range 4-12C	1-15	15	15
37	Adaptation Sensitivity 2 Outside Air Range <4C	1-15	15	15
40	Maximum HWS Set Point	8-80	60	60
41	HWS Switching Differential (QAZ21 Sensor Only)	0-20	5	5
42	Legionella Function 0. Off 1. On.	0-1	0	0
50	Cascade Strategy 1-3 Automatic 4-6. Fixed	1-6	3	3
51	Minimum % Output reached Prior to Switching Off a Module In the Cascade	5-100	20	20
52	Maximum % Output Reached Prior to Switching On a Module In The Cascade	5-100	85	85
56	Time Spent By Module On Ignition Rate Prior to Modulation (Delay Time Between Modules)	0-1200	0	0
60	Minimum Temperature Difference Between Flow/ Return Sensor Readings Prior to The Return Sensor Becoming Lead	0-20	2	2
90	Display Default 0. Time of Day 1. System Flow Temperature (CA)		1	1
91	Software Version	00.0-99.9	#	#
92	RVA47 Manager Operating Hours	0-500,000	--	--

Control Parameter Default Settings.**14.2 Module LMU64 Setting. (Images of QAA73 Room Unit/Service Tool in Section 16.3)**

The Single and Cascade Master units are preset for correct operation.
However the slave units may require modest parameter updating. (Usually limited to H605)

The following Pages detail the parameters of the modules and the Standard Factory settings, please note, the installer/commissioning engineer may have changed some of these settings to suit the system installed.

To access the parameters detailed below a QAA73 Room Unit is required. The unit must be connected to the respective Module Controller Via the dedicated Plug, Behind cover plate (4) or directly to the respective LMU64 module controller. Via the X10:01 Terminal.

There are two levels of access available, as follows. If you cannot access a particular parameter line, please consult with MHG Heating Ltd Technical Department for further assistance.

- | | | |
|--------------------------|---|--|
| Level One
(Installer) | - | Press & Hold the   or   Program Buttons simultaneously for at least 3 seconds. Use the   Program Buttons to access the desired parameter line. Use the   Button to alter the displayed parameter to the required setting. |
| Level Two
(OEM) | - | Press & Hold the   Program Buttons simultaneously for at least 3 seconds Use the   Program Buttons to access the desired parameter line. Use the   Button to alter the displayed parameter to the required setting. |

An altered parameter will be saved to the controllers memory by leaving the displayed parameter when either of the   Program Buttons are pressed.

To exit the parameter review and amendment levels the INFO Button of the QAA73 must be pressed. Any unsaved parameter alterations will be lost if the QAA73 is version 1.3 or lower.

QAA73 #	Description	Range	150 & 225 Single Defaults	150 & 225 Cascade Master Defaults	150 & 225 Cascade Slave Defaults
H90	Reduced Temperature for DHW	8...60	10	10	10
H91	DHW Production Control <i>(0=Time control 1=Constant)</i>	0...1	0	0	0
H93	DHW Production Control 0=Non Eco 1=Eco	0...1	0	0	0
H94	DHW Secondary Pump Control <i>(0= As H91. 1= As HWS Time Switch) (K2, X2:03, H615:6)</i>	0...1	0	0	0
H503	Minimum boiler setpoint temperature <i>(20 °C<=TkSmin<=TkSmax)</i>	20 ... 90 °C	20	20	20
H504	Maximum boiler setpoint temperature <i>(TkSmin<=TkSmax<=90 °C)</i>	20 ... 90 °C	90	90	90
H505	Boiler setpoint at design outside temperature	20 ... 90 °C	85	85	85
H506	Minimum flow setpoint temperature <i>(20 °C<=TvSmin<=TvSmax)</i>	20 ... 90 °C	25	25	25
H507	Maximum flow setpoint temperature <i>(TvSmin<=TvSmax<=90 °C)</i>	20 ... 90 °C	90	90	90
H516	Summer / winter changeover temperature <i>(30 °C: S / W changeover deactivated)</i>	8 ... 30 °C	18	18	18
H532	Heating curve slope heating circuit 1	1 ... 40	32	32	32
H533	Heating curve slope heating circuit 2	1 ... 40	32	32	32

QAA73 #	Description	Range	150 & 225 Single Defaults	150 & 225 Cascade Master Defaults	150 & 225 Cascade Slave Defaults
H536	Maximum speed at maximum output in heating mode (maximum speed limitation)	0 ... 9950 rpm	7000	7000	7000
H541	Maximum degree of modulation in heating mode (LmodTL <= PhzMax <= LmodVL)	0 ... 100 %	100	100	100
H542	Minimum boiler output in kW (lower calorific value)	0 ... 9999 kW	15	15	15
H543	Maximum boiler output in kW (lower calorific value)	0 ... 9999 kW	75	75	75
H544	Overrun time of pumps, max. 210 min (setting 255: continuous operation of Q1)	0 ... 255 min	10	10	10
H545	Minimum burner pause time (heat demand-dependent switching hysteresis)	0 ... 3600 s	300	300	300
H551	Constant for quick setback without room influence	0 ... 20	2	2	2
H552	Hydraulic system adjustment	0 ... 255	80	80	80
H554	Setting flags: status code open-circuit sensor for ANx channel suppressed / not suppressed	0 ... 255	b0=1 b1=0 b2=1 b3=1 b4=0 b5=1 b6=0 b7=0	b0=1 b1=0 b2=1 b3=1 b4=0 b5=1 b6=0 b7=0	b0=1 b1=0 b2=1 b3=1 b4=0 b5=1 b6=0 b7=0
H555	Setting flags	0 ... 255	b0=0 b1=0 b2=0 b3=0 b4=1 b5=0 b6=0 b7=0	b0=0 b1=0 b2=0 b3=0 b4=1 b5=0 b6=0 b7=0	b0=0 b1=0 b2=0 b3=0 b4=1 b5=0 b6=0 b7=0
H558	Setting flags	0 ... 255	b0=1 b1=0 b2=0 b3=0 b4=0 b5=0 b6=1 b7=0	b0=1 b1=0 b2=0 b3=0 b4=0 b5=0 b6=1 b7=0	b0=1 b1=0 b2=0 b3=0 b4=0 b5=0 b6=1 b7=0
H596	Running time of actuator in heating circuit 2 (TimeOpening / TimeClosing)	30 ... 873 s	150	150	150
H605	LPB device number of LMU * Module numbering 150 Single & Master Upper 2 Lower 3 Cascade Slave Upper 4, Lower 5.....16 ETC 225 Single & Master Upper 2, Middle 3, Lower 4 Cascade Slave Upper 5, Middle 5, Lower 6.....16 ETC	0 ... 16*	2,3, (150)* 2,3,4 (225)*	2,3, (150)* 2,3,4 (225)*	4,5-16 (150)* 5,6,7-16(225)*
H606	LPB segment number of LMU	0 ... 14	0	0	0
H614	Program input LMU basis	0 ... 255	3	3	3
H615	Function programmable output K2 LMU	0 ... 255	0	0	0
H618	Progr input on clip-in function module	0 ... 255	0	0	0
H619	Function output1 clip-in function module	0 ... 255	0	0	0
H620	Function output2 clip-in function module	0 ... 255	0	0	0
H621	Function output3 clip-in function module	0 ... 255	0	0	0

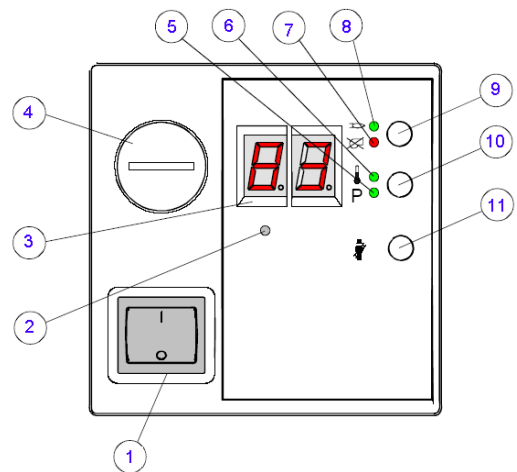
QAA73 #	Description	Range	150 & 225 Single Defaults	150 & 225 Cascade Master Defaults	150 & 225 Cascade Slave Defaults
H622	Maximum value of heat demand with external predefined temperature setpoint (5 °C ≤ T _{AnfoExtMax} ≤ 130 °C)	5 ... 130 °C	85	85	85
H630	Setting flags of maintenance alarms	0 ... 255	b0=1 b1=0 b2=0 b3=0 b4=0 b5=0 b6=0 b7=0	b0=1 b1=0 b2=0 b3=0 b4=0 b5=0 b6=0 b7=0	b0=1 b1=0 b2=0 b3=0 b4=0 b5=0 b6=0 b7=0
H636	Months (interval) since last service visit	0 ... 255 months	0	0	0
H700	1st Historical Fault – Number of Occurrences.				
H701	1st Historical Fault – Operating Phase.				
H702	1st Historical Fault – Operating Error Code				
H703	2nd Historical Fault – Number of Occurrences.				
H704	2nd Historical Fault – Operating Phase.				
H705	2nd Historical Fault – Operating Error Code				
H706	3rd Historical Fault – Number of Occurrences.				
H707	3rd Historical Fault – Operating Phase.				
H708	3rd Historical Fault – Operating Error Code				
H709	4th Historical Fault – Number of Occurrences.				
H710	4th Historical Fault – Operating Phase.				
H711	4th Historical Fault – Operating Error Code				
H712	5th Historical Fault – Number of Occurrences.				
H713	5th Historical Fault – Operating Phase.				
H714	5th Historical Fault – Operating Error Code				
H715	Current Historical Fault – Number of Occurrences				
H716	Current Historical Fault – Operating Phase.				
H717	Current Historical Fault – Operating Error Code				
H718	Hours run burner	0 ... 131070 hrs	0	0	0
H719	Hours run heating mode	0 ... 131070 hrs	0	0	0
H720	Hours run DHW heating	0 ... 131070 hrs	0	0	0
H721	Hours run zone	0 ... 131070 hrs	0	0	0
H722	Start counter	0 ... 327675	0	0	0
H727	Current Fault Code – ALBATROS Error Code	0 ... 583			
H728	1st Historical Fault – ALBATROS Error Code				

QAA73 #	Description	Range	150 & 225 Single Defaults	150 & 225 Cascade Master Defaults	150 & 225 Cascade Slave Defaults
H729	2nd Historical Fault – ALBATROS Error Code				
H730	3rd Historical Fault – ALBATROS Error Code				
H731	4th Historical Fault – ALBATROS Error Code				
H732	5th Historical Fault – ALBATROS Error Code				
H732	Current Historical Fault – ALBATROS Error Code				
H755	Measured value of ionization current	-			

Module Controller

Legend

1. Module Power Isolator
2. Infrared Output to Flue Gas Analyser Optional Extra.
3. Module Numerical Indicator
4. Temporary Connection Port For QAA73 Unit
5. Indication of System Pressure **P** (Not Used)
6. Indication of Module Over Temperature
7. Indication of Module Lockout
8. Indication of Module Burner Activation
9. Module Lockout Reset Button (To be pressed for at least 3 Seconds)
10. Display Alteration Button
11. Commissioning Mode Activation Button

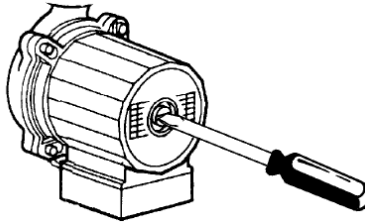


15.0 Commissioning The Appliance

15.1 Pre-Commissioning Checks

Prior to undertaking the commissioning of the unit please ensure that the system water has been cleansed and treated with a suitable inhibitor as detailed in Filling the system and system water quality.

Prior to applying power to the individual modules their dedicated circulation pumps should be bleed and checked to ensure free rotation of the armature.



15.2 Combustion System Commissioning.

The commissioning function enables the boiler to be started up in heating mode by pressing the  Chimney Sweep Button (11) on the module controller.

There are two levels of operation accessed via the Chimney Sweep Button (11)

Operation at Maximum Output With No Adjustment.

Pressing the  Chimney Sweep Button (11) for more than 3 seconds but less than 6 seconds places the respective module in High Fire mode.

To indicate that the module is operating under the control of the  Chimney Sweep Button the display (3) will indicate SF and the red Lockout LED (7) will flash with a single pulse.

This mode is maintained until the limit thermostat temperature is reached or the  Chimney Sweep Button is pressed from more than 1 second.

Operation at Maximum or Minimum Output For Flue Gas Analysis and Gas Valve Adjustment

Pressing the  Chimney Sweep Button (11) for more than 6 seconds. places the respective module in High Fire mode.

To indicate that the module is operating under the control of the  Chimney Sweep Button the display (3) will indicate 100 for High Fire and 0 for Low Fire and the red Lockout LED (7) will flash with a double pulse.

To alternate the module between High Fire and Low Fire the  Chimney Sweep and  P Buttons must be pressed for less than 1 second.

 P Button	High Fire	 Button	Low Fire
--	-----------	--	----------

This mode is maintained until the limit thermostat temperature is reached or the  Chimney Sweep or  P Button is pressed from more than 1 second. The module stops operating when the button is released.

Whilst the module is operating under the control of the Chimney Sweep Button (with adjustment) the gas valve can be adjusted to give correct flue gas analysis readings.

Each module is equipped with a modulating gas valve.

The modulating gas valve must be set at High Fire and Low Fire to ensure correct operation throughout its modulating range.

It is advisable to check the combustion figures on High and Low Fire prior to carrying out any adjustments.

Adjusting the High Fire has a marked effect on the Low Fire figures.
Where as adjusting the Low Fire has little effect on the High Fire figures.

The High fire adjustment is carried out via the 2.5mm Allen Key socket D

The High Fire adjustment is a Gate type restrictor.

Therefore turning the screw clockwise will close the gate and thus restrict the quantity of gas passing through to the burner.

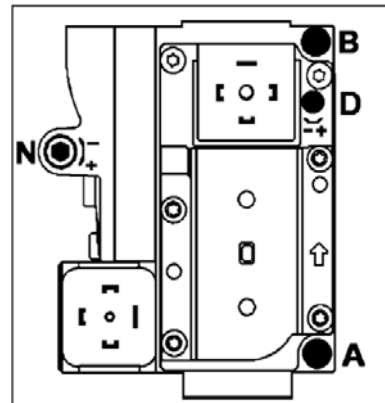
The Low fire adjustment is carried out via the 2.5mm Allen Key socket N

The Low Fire adjustment is a diaphragm governor.

Therefore turning the screw clockwise will increase the pressure on the diaphragm and thus increase the quantity of gas passing through to the burner.

Legend

- A. Valve Inlet Gas Pressure Test Point
- B. Valve Outlet Gas Pressure Test Point
- D. High Fire Adjuster (Gate Type)
- N. Low Fire Adjuster (Governor Type)



Each module must be analysed and adjusted separately.

This is undertaken by inserting the analysers probe in to the silicone sampling tube secured to the top of each module and sealed with a black plug. If fluctuating figures are obtained the flue gas analyser should be inserted directly into the module flue spigot once the silicone tube has been temporally removed. (Taking care not to dislodge the grommet)

Each module must be set to the following combustion figures.

Gas Type	Injector Size	High Fire	Low Fire
Natural Gas (G20)	15mm (Exploded Part #79)	8.5% CO ₂	9.0% CO ₂
LPG (G31)	10mm (Exploded Part #79)	11.0% CO ₂	11.0% CO ₂

15.3 Conversion of the Appliance to Operate on LPG (G31).

Unless specified at the time of ordering the appliance/s will be supplied ready to operate on a Natural Gas (G20) fuel supply.

The appliances data badge will indicate the type of fuel gas the modules have been set to operate with.

Prior to firing the unit for the first time it is advisable to check the size of the gas injector of each module. The injectors are located on the outlet of module gas valves.

The table above indicates the size of injector for the respective fuel gas.

If the unit is required to operate on a fuel gas different from that to which it is currently set, the following conversion procedure must be undertaken.

Isolate the fuel and electrical supplies at the appliances or module isolator.

Disconnect the electrical connection for the gas valves solenoid coils.

Disconnect the gas valve from the yellow gas supply tubing at the union immediately prior to the gas valves inlet.

Remove the 'Circlip' located at the outlet of the valve securing the injector to the fan inlet elbow.

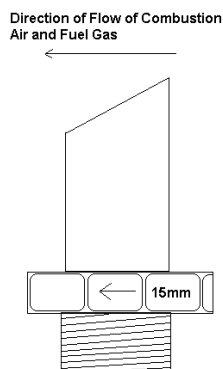
Extract the gas valve and injector from the fan inlet elbow. Noting the orientation of the injector with regards to the flow of combustion air/gas into the modules burner.

Install the correctly sized injector into the outlet of the gas valve ensuring to apply the sealing washer.

A 'Gas Flow Direction Arrow' has been marked on the injector to ensure the injector is installed in the correct position/orientation.

Reinstall the gas valve/s complete with correct sized injector/s in the reverse order.

Following completion of the re-injectoring of all modules the units will require recommissioning as detailed in section 15.2.



16.0 Routine Inspection and Servicing .(A QAA73 Room Unit/service tool is required to reset the modules service interval timer.)

As with all Gas Appliances, we would highly recommended that a competent heating engineer services the ProCon HT, at least every 12 months. This is assuming a normal daily usage of 8 – 10 hours.

If however the boiler is to be operated 24 hours a day, 7 days, we would recommend services every 6 months

The ProCon HT boilers will display an E105 Error Code when 12 months has lapsed, indicating that the appliance requires a Routine Service Inspection. This code will also be displayed on the RVA47 cascade manager.

If the Installer/Commissioning Engineer is unable to undertake the Routine Service Inspection, as detailed Section 16.1, please contact the MHG Technical Department, who will be able to arrange the Routine Service Inspection to be undertaken.

16.1 Routine Service Inspection

Before commencing any service/maintenance work, the following tasks must be undertaken.

- a) Ask the end user about any problems with the operation of the boiler unit and note their comments.
- b) Check the water pressure of the installation.
- c) Remove the boiler casing and visually inspect all pipe and water joints for signs of leakage.
- d) Inspect the top of the casing and the top of the heat exchangers for signs of water leakage or ingress.
- e) Run the unit in Commissioning Mode HIGH FIRE; with the use of a flue gas analyzer record the CO₂ level. See section 15.2
- f) Run the unit in Commissioning Mode LOW FIRE; with the use of a flue gas analyzer record the CO₂ level. See section 15.2
- g) Listen to the sound of the combustion fan. Utilizing a QAA73 room unit/service tool if available and the instructions in Section 14.2, review the modules LMU Operating Error Codes, and note the recorded codes onto the Service Report. (H700 – H722)
- h) Undertake a System Water Analysis to check the concentration level of the Water Treatment, and note the level onto the Service Report.
- i) Check the flue route including the terminal position for conformity with prevailing regulations, and trim back any foliage that may be around the terminal.
- j) Check the plant room/compartment ventilation system for conformity with prevailing regulations.
- k) Check the Pressure (Safety) Relief Valve size, rating and orientation, for conformity with prevailing regulations.

The results of the Inspections undertaken above must be acted upon, and all discrepancies should be recorded on the Service Report and brought to the Client / End User's attention.

Undertake any maintenance, and if necessary any preventative maintenance, that's required.

16.2 Routine Cleaning & Maintenance

As part of the Routine Service Inspection, certain areas of the boiler need to be checked and cleaned as necessary.

- a) Turn the boiler OFF at the ON/OFF switch and electrically isolate the boiler by removing the plug or fuse from the boiler supply.
- b) Turn off the gas at the boiler isolation tap, fitted by the installer, adjacent to the appliance.
- c) Remove both electrical connections from the module fan assemble.
- d) Disconnect the earth lead, HT cap and Lead from the ignition electrodes.
- e) If installed remove the combustion air intake duct from the combustion fan air inlet elbow.
- f) Remove the 'Circlip' securing the gas injector into the fan inlet elbow and extract the gas valve and injector assembly. (Inspect and clean both the injector and gas valve assembly.)
- g) Disassemble the burner by removing the six M6 nuts around the burner door, using a 10mm Spanner. Pull the burner forward and remove from the heat exchanger. Gently put to one side.
- h) Once access has been gained to the combustion chamber and front section of the heat exchanger, visually inspect the heat exchanger coils.
It is usually only necessary to clean the front section of the heat exchanger. If server deposits are found, the rear section of the heat exchanger should also be checked and cleaned, which will necessitate the removal of the heat exchanger from the boiler.

If any coils appear to be significantly dis-coloured, then a blockage of either scale, magnetite, or general system debris has occurred which will have allowed excessive overheating to have occurred within the coil.

If dis-colouration has occurred, then specialist de-scaling of the heat exchanger will be required, however, stress cracking may have occurred, and the heat exchanger may become porous following the de-scale works.

- i) If the heat exchanger has not suffered from dis-colouration, as 'Item h' above, then a Standard Service can be undertaken. Using a natural bristled brush **ONLY**, remove the worst of the mineral/debris build up.
With the use of the dissolved *ProCon Combustion Chamber Cleaning Granules*, spray the solution onto the heat exchanger surface and leave for approximately 5 minutes. This will help to remove any stubborn mineral deposits. Finally brush the heat exchanger whilst rinsing thoroughly with copious amounts of fresh water. *ProCon Combustion Chamber Cleaning Granules* are available from MHG Heating Ltd Spares Department. **A STEEL OR PVC BRUSH MUST NOT BE USED TO CLEAN THE HEAT EXCHANGER.**
- j) Following the cleaning of the Heat Exchangers, the condensate syphon must be flushed to ensure that all mineral deposits/debris that has been washed from the heat exchanger surface is correctly removed. Open the syphon cleaning point cap at the base of the boiler, with a suitable receptacle directly below to collect the syphon contents. Safely dispose of the contents of the syphon. Replace the receptacle below the cleaning point and pour 2 litres of clean tap water into each of the heat exchangers, which will drain through the cleaning point. Refit the cleaning point cap and pour half a litre of clean tap water into one of the heat exchangers to ensure the syphon is re-flooded. Check the cleaning point cap for leaks.
- k) Visually check the burner surface for signs of damage and debris build-up. Remove any debris build up with compressed air. If excessive debris build-up is identified, the burner lance should be removed and the inner metal surface should be washed and cleaned. **A BRUSH, OF ANY KIND, MUST NOT BE USED TO CLEAN THE BURNER SURFACE.** If damage has occurred to the burner surface, the burner **MUST** be replaced.
- l) Check the combustion fan blades for debris build-up. Remove any debris with a soft bristle brush or preferably compressed air. **DO NOT TOUCH, OR SPIN, THE FAN BLADES WITH YOUR FINGERS AS THIS COULD AFFECT THE BALANCING OF THE FAN BLADES.**
- m) Re-fit the Burners, in the reverse order of dismantling, ensure that all electrical connections are correctly and securely connected.
- n) Inspect all water joints. Any joints found to be leaking **MUST** be replaced. It is also advisable when replacing water joints to also change any adjacent joints at the same time.
- o) Inspect all gas joints with a suitable leak detection method. Any joints found to be leaking **MUST** be replaced. It is also advisable when replacing gas joints to also change any adjacent joints at the same time.
- p) Inspect and clean the condensate neutralising tank, replenishing the neutralising granules as required. Granules available from MHG Heating Ltd Spares Department.
- q) With the use of a suitable Flue Gas Analyser, check and adjust the combustion settings, as detailed in Section 15.2.
- r) Inspect the general condition of the flue system, including the termination, repair as necessary or advise on any remedial action as required.
- s) Following the satisfactory completion of the above service procedure, the internal Routine Service Control Timer needs to be reset. Utilising the QAA73 Room Unit/Service Tool gain access to the Second Level Parameters, as detailed in Section 14.2, and select Parameter Line H630 – Bit 6. using the + button, adjust the value from 0 to 1 and press the INFO button to reset the Service Interval counter.

16.3 QAA73 Room Unit/Service Tool

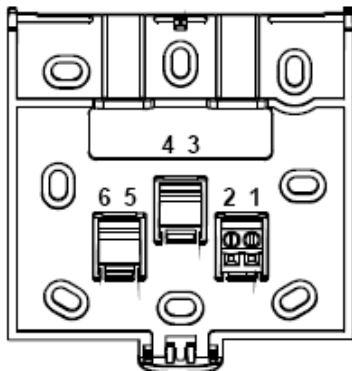
QAA73 Door Closed



QAA73 Door Open



QAA73 Mounting Plate/Terminals



The QAA73 Room Unit/Service Tool must be connected to the X10:01 terminals (Not Polarity Sensitive) of the respective LMU64 controller to access the required fault history parameters and to reset the service interval timer as detailed in sections 16.1 and 16.2.

17.0 Optional System Controls.

If required the following controls can be applied to the ProCon HT range to enhance boiler and system operational efficiency and longevity. (Further detailed guidance can be obtained from the respective controller manuals.)

RVA63 Dual Zone Controller.



This dual zone controller has the capability to control up to two independent CT/VT or a mixture of both. The RVA63 dual zone controller communicates with the master boiler mounted RVA47 Cascade Manager via LPB, offering enhanced communication, zone and module temperature control. A dedicated housing is also available to ease the installation process.

RVA46 Single Zone Controller.



This single zone controller has the capability to control one CT/VT zone. The RVA46 single zone controller communicates with the master boiler mounted RVA47 Cascade Manager via LPB, offering enhanced communication, zone and module temperature control. A dedicated housing is also available to ease the installation process.

QAA70 Modulating Full Function Room Unit.(One unit per zone.)



This modulating full function room unit offers the heating user full remote access to the all functions that effect the provision of heat to the respective zone. The unit also displays information from all attached temperature sensors. Boiler, Hot water, Outside and remote tamperproof room unit(QAW44).

QAA50 Modulating Limited Function Room Unit.(One unit per zone.)



This modulating limited function room unit offers the heating user reduced remote access to operating mode and temperature functions that effect the provision of heat to the respective zone.

QAA10 Modulating Tamper-proof Room Sensor. (One Unit per zone.)



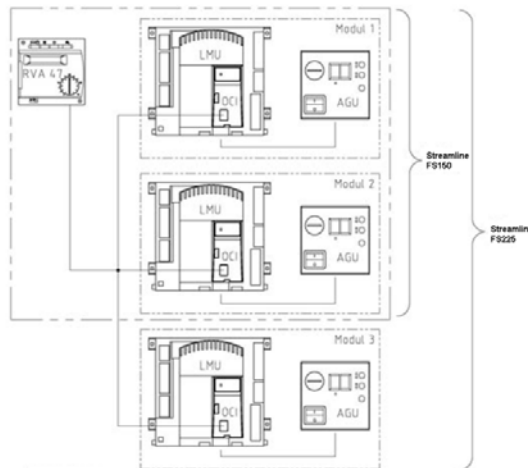
This modulating tamper-proof room unit offers room temperature feedback from the heated space that effects the provision of heat to the respective zone.

18.0 Internal Wiring

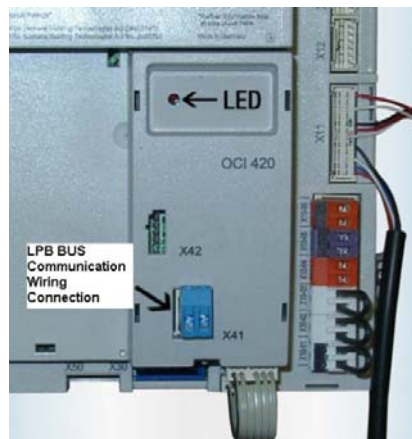
The internal wiring configurations of the ProCon HT 150/225 differ dependant upon the model. Single/Cascade Manager/Cascade Slave.

In all but the Cascade Slave units a RVA47 Cascade Manager is installed. The RVA47 Cascade Manager Communicates with the individual LMU64 module controllers via the LPB wiring loom.

In the case of the Cascade Slave unit the LPB wiring is in place, however the control communication is generated by the RVA47 Cascade Manager housed in the Cascade Master boiler.



18.1 Module Operation Indication



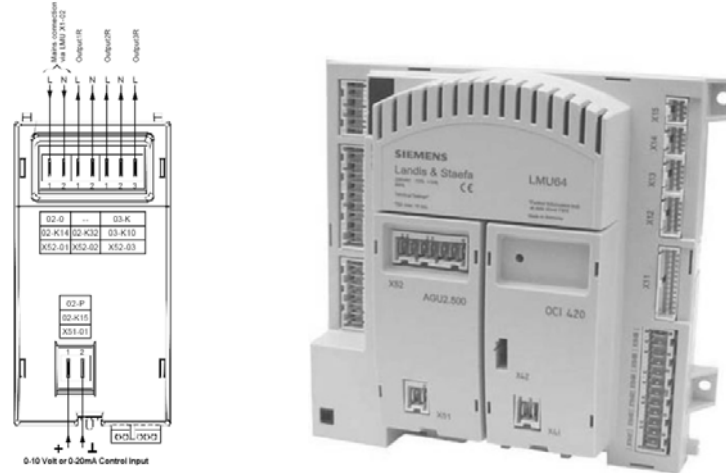
Communication Operation Indications

The RED LED on the OCI420 communication clip mounted on the front of each LMU64 module controller flashes to indicate the detected operational status of the module dictated by the LPB communication from the ProCon HT Masters RVA47 Cascade Manager.

LED FLASH STATUS	INTERPRETATION OPTIONS
LED ON Constantly	OCI420 not configured to operate with LMU64
LED OFF Constantly	OCI420 Configured. LPB Short Circuit / No Power.
LED ON 93% OFF 7%	OCI420 and LUM64 Not Compatible / LPB Address inadmissible.
LED ON 5% OFF 95%	Boiler being controlled via LPB and required to be not operating.
LED ON 5% OFF 20% ON 5% OFF 70%	Boiler being controlled via LPB and required to be operating.

18.1.1 BMS Interface Clip Installation and Parameter Alteration

Following the installation of the AGU2.511 communication clip (complete with base mounted wiring connection) onto the front of the LMU64 controller a number of operational parameters within the unit must be altered to ensure the clips operates as required.



LMU64 Pictured above with AGU2.511 and OCI420 communication clips.

A number of parameters will require altering within the LMU64 controller from their standard default setting to allow the AGU2.511 communication clip to operate correctly.

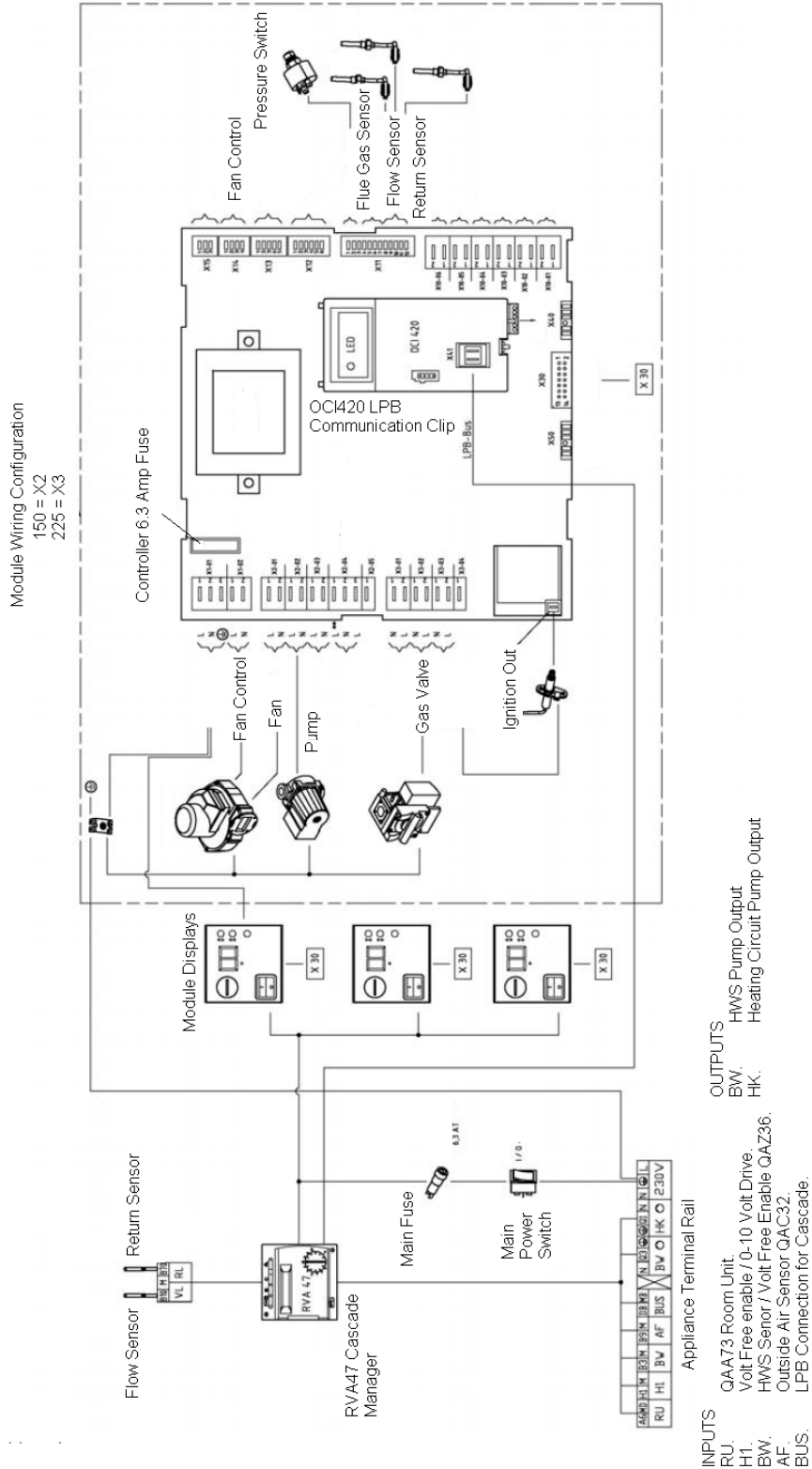
Access is gained to the H parameters by pressing the PROG $\nabla/\triangle$ buttons simultaneously for 3 seconds unit H 90 appears on the screen. The required H parameters can then be reached by using the PROG ∇ or $\triangle$ buttons.

Once at the required H parameter the required setting is achieved by using the $\leftarrow/\rightarrow$ buttons.

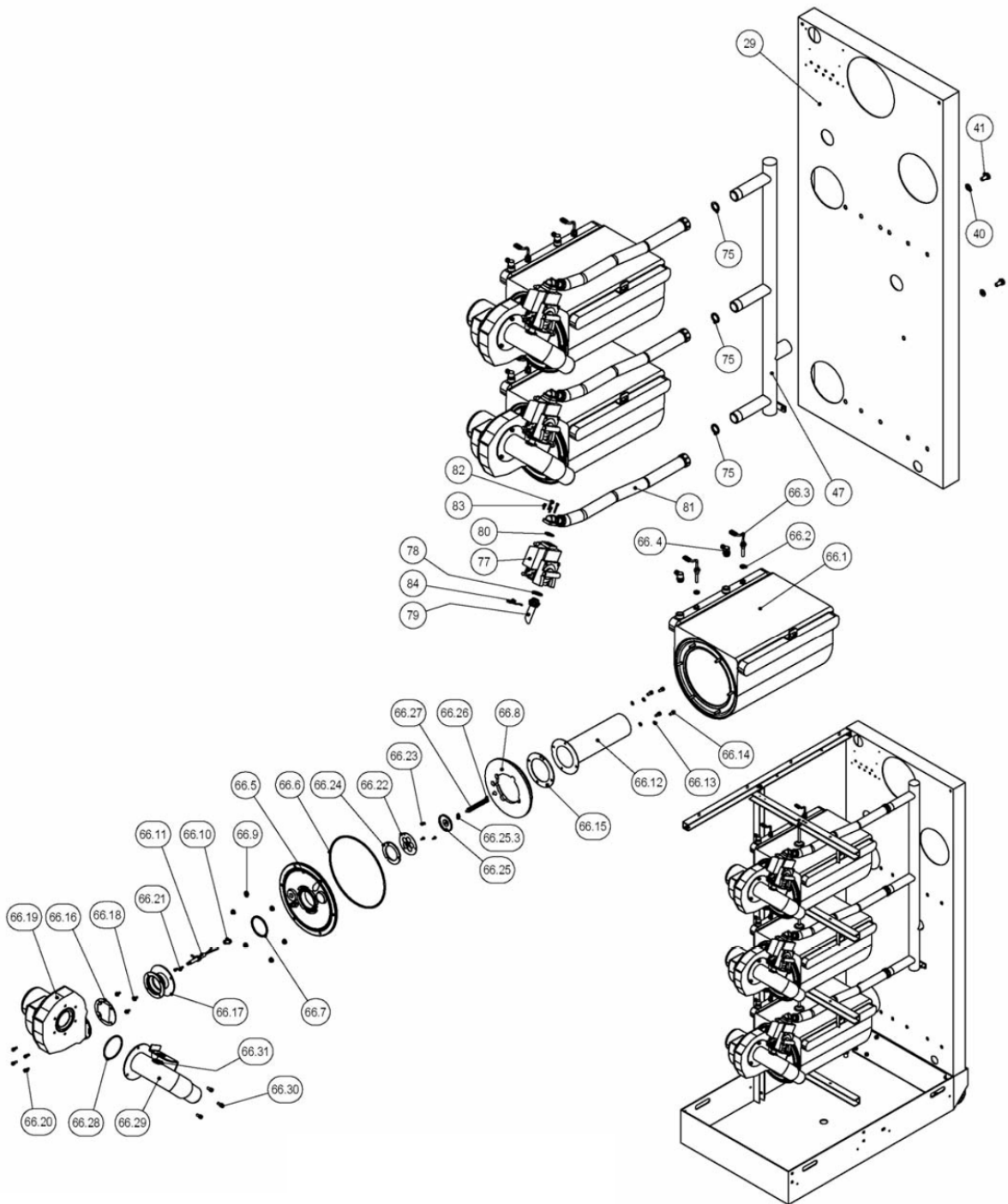
To save the alteration in the controller the INFO button must be pressed.

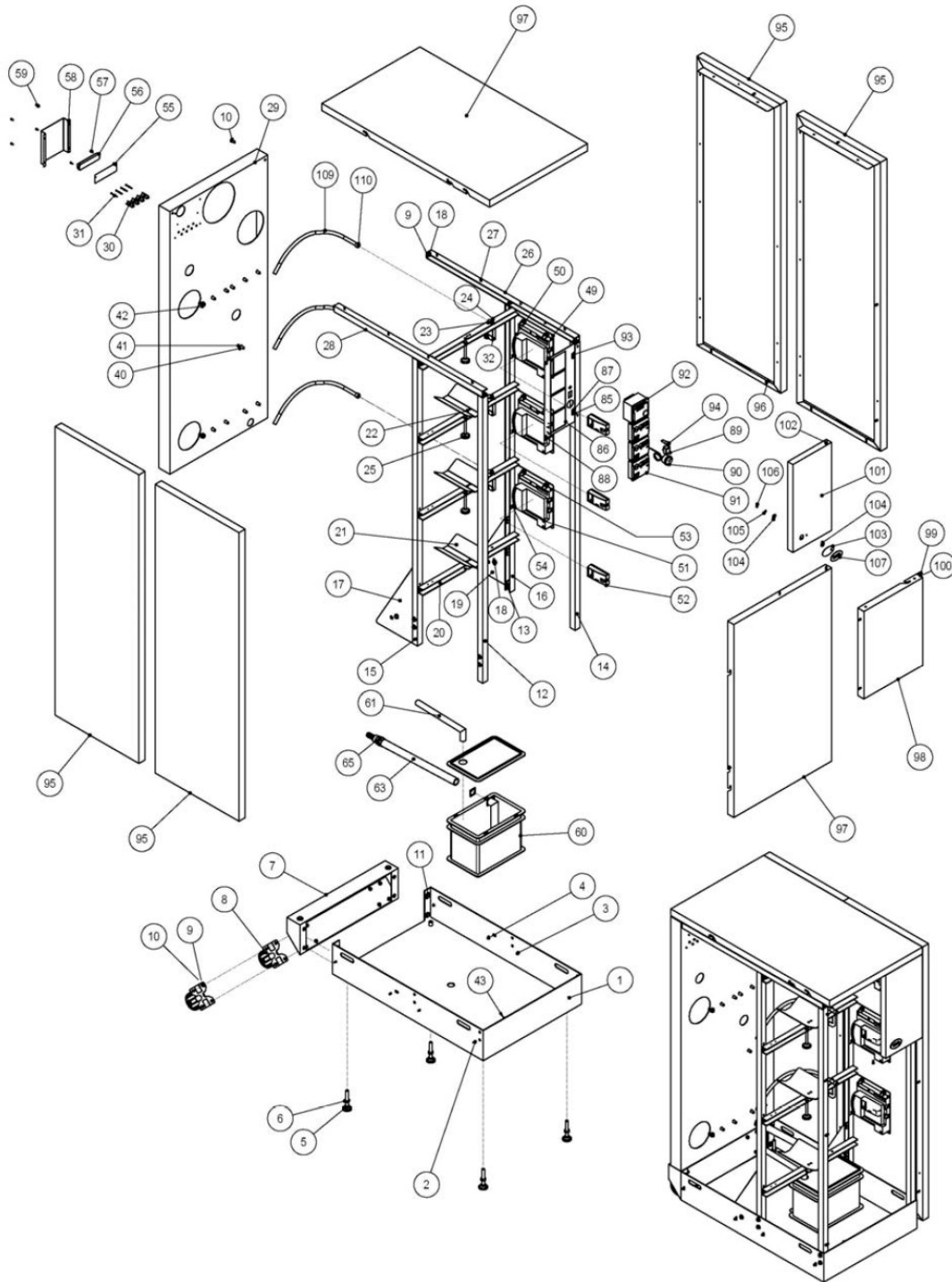
Parameter #	Description	Default	New Setting
	Programmable Inputs (Not to be used With ProCon HT as the control is achieved via the RVA47 Cascade Manager.)		
H618	Input control configuration Input value interpretation affected by H622 or H623 Dependant upon control requirement. (4 is recommended.)	0	4. Predefined Temperature set point 5. Predefined Boiler Output 6. Low Loss Header Sensor
H622	Maximum Temperature Via X51 input 0-10 Volt When H618 is set to 4	85	85
H623	Percentage level reached by input prior to boiler activation. When H618 is set to 5	5	5
	Programmable Outputs		
H619	Relay designation for Output from Orange Plug Left Terminal Live. Right Terminal Neutral. Output rated at 240 Volts 0.5 Amp	0	0. Hydraulic Diagram Derived. 1. LPG SSOV Output. 2. Boiler Fault Output. 3. Boiler Operating Output. 4-12 Non Supported Output.
H620	Relay designation for Output from Clear Plug Left Terminal Live. Middle Terminal Neutral. Output rated at 240 Volts 0.5 Amp	0	0. Hydraulic Diagram Derived. 1. LPG SSOV Output. 2. Boiler Fault Output. 3. Boiler Operating Output. 4-12 Non Supported Output.
H621	Relay designation for Output from Clear Plug Right Terminal Live. Output rated at 240 Volts 0.5 Amp	0	0. Hydraulic Diagram Derived. 1. LPG SSOV Output. 2. Boiler Fault Output. 3. Boiler Operating Output. 4-12 Non Supported Output.

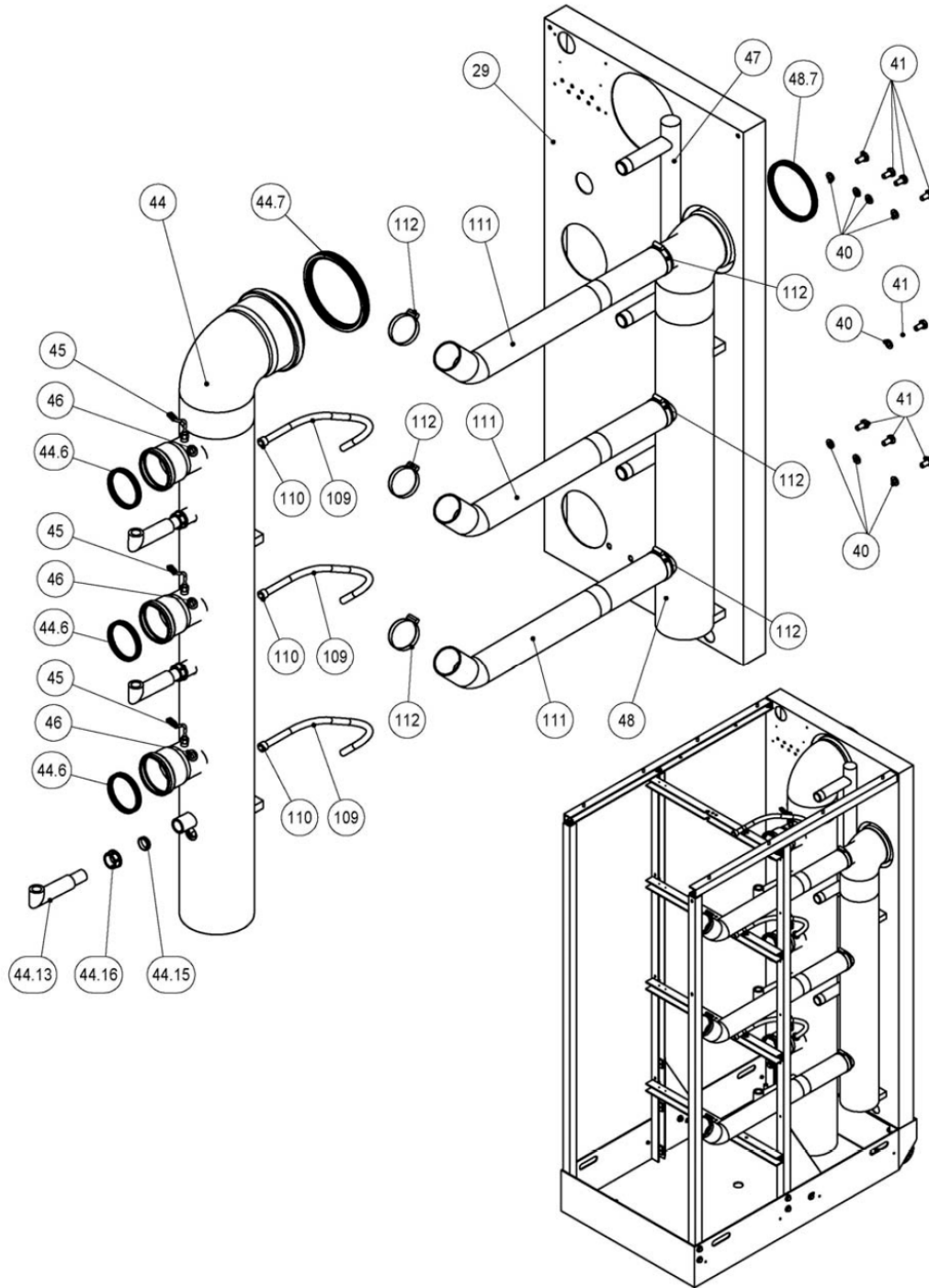
18.2 Internal Wiring Diagram

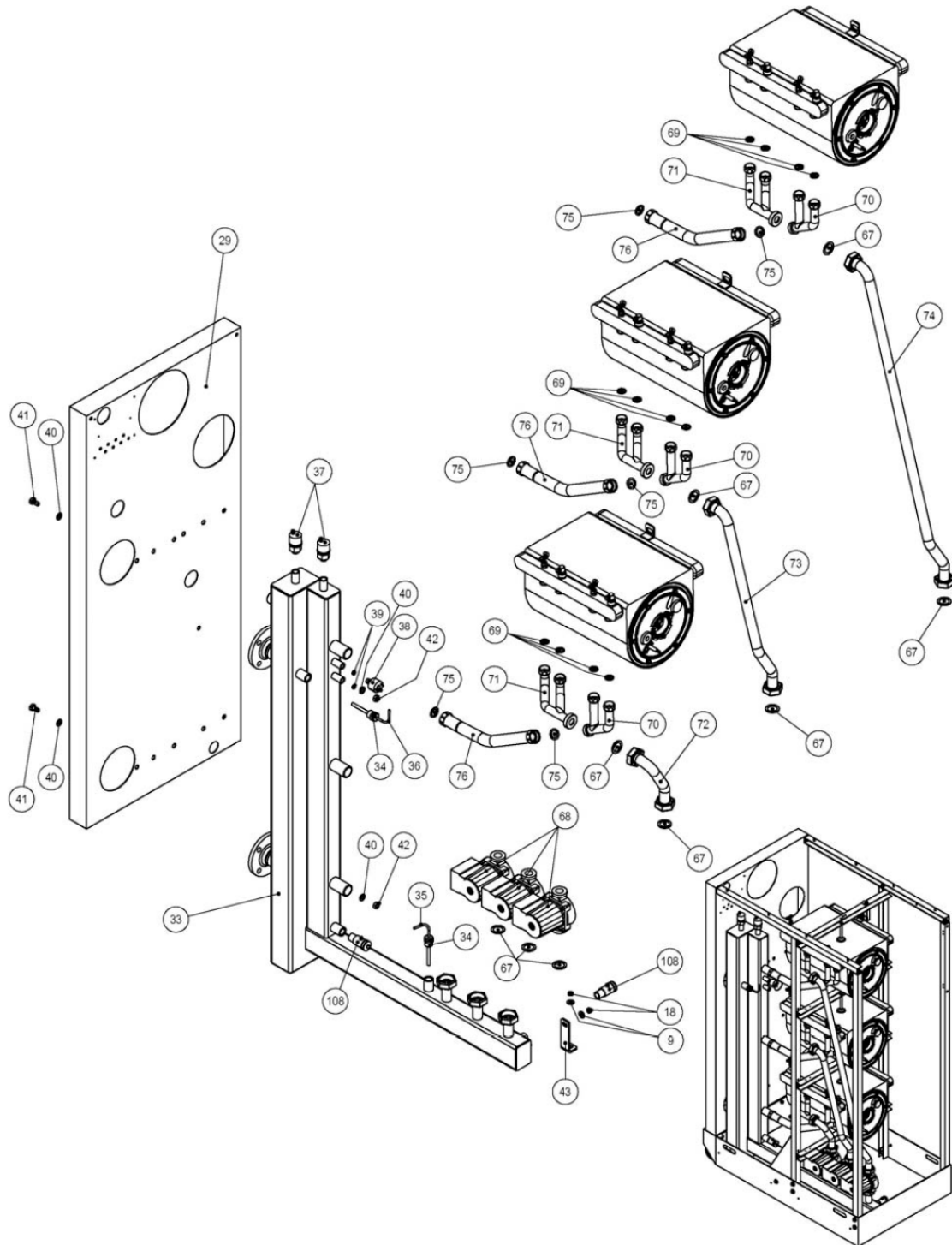


19.0 Exploded Diagram









20.0 Spares Listings

#	150 Single	150 Cascade Master	150 Cascade Slave	225 Single	225 Cascade Master	225 Cascade Slave	Description	Part Number
1	1	1	1	1	1	1	Base Tray	96.35460-7020
2	8	8	8	8	8	8	Base Tray Securing Bolts	94.15393-5001
3	32	32	32	32	32	32	Toothed Washer ; A5.3	On Request
4	32	32	32	32	32	32	Hexagonal Nut ; M5	On Request
5	4	4	4	4	4	4	Leveling Feet ; M12 x 98	94.17230-7001
6	4	4	4	4	4	4	Hexangular Nut for Levelling Feet ; M12;	On Request
7	1	1	1	1	1	1	Roller Mounting Panel	96.36560-7032
8	2	2	2	2	2	2	Roller D= 80 mm, H= 108 mm	94.17273-7001
9	44	44	44	45	45	45	Washer ; 8,4	On Request
10	46	46	46	47	47	47	Bolt ; M8 x 16	On Request
11	9	9	9	9	9	9	Washer 8,4 x 24 x 2	On Request
12	1	1	1	1	1	1	Vertical Support Left Front	96.35760-7004
13	25	25	25	25	25	25	Rectangular Nut M8, 30 x 20 x 4	95.99196-0022
14	1	1	1	1	1	1	Vertical Support Right Front	96.35760-7003
15	1	1	1	1	1	1	Vertical Support Left Rear	96.35760-7006
16	1	1	1	1	1	1	Vertical Support Right Rear	96.35760-7005
17	1	1	1	1	1	1	Vertical Support Support Left	96.35760-7011
18	16	16	16	19	19	19	Rectangular Nut; M8;	On Request
19	1	1	1	1	1	1	Vertical Support Support Right	96.35760-7012
20	4	4	4	4	4	4	Brace Support	96.35760-7007
21	2	2	2	3	3	3	Heat Exchanger Cradle	96.36560-7030
22	4	4	4	6	6	6	Pop rivet 6,4 x 12,5	On Request
23	2	2	2	3	3	3	Cable Brackets D=12,7	95.99186-0060
24	2	2	2	3	3	3	Cable Bracket Bolt M5	On Request
25	2	2	2	3	3	3	Heat Exchanger Support Bolt	94.17230-7002
26	1	1	1	1	1	1	Horizontal Frame Support Left	96.35760-7001
27	21	21	21	21	21	21	Case Mounting Stud	96.36689-7008
28	1	1	1	1	1	1	Horizontal Frame Support Right	96.35760-7002
29	1	1	1	1	1	1	Rear Casing Panel	96.35460-7021
30	4	4	4	4	4	4	Cable Supports	96.39658-7001
31	8	8	8	8	8	8	Cable support screws	On Request
32	2	2	2	3	3	3	Heat Exchanger Support	96.36560-7031
33	1?	1	1	1?	1	1	Low Loss Header Assembly	96.36144-7042
33	---	1	1	---	1	1	Distribution Header Assembly Cascade Units Only	96.36144-7046
34	2	2	2	2	2	2	Return Sensor Pocket ½"x80mm	96.38235-7001
35	1	1	1	1	1	1	Return Temperature Sensor QAZ21/0720	96.00022-0943
36	1	1	1	1	1	1	Flow Temperature Sensor QAZ21/0720	94.19314-5001
37	2	2	2	2	2	2	Automatic Air Releases 3/8"	94.74400-5003
38	1	1	1	1	1	1	Water Pressure Switch, 0,8 bar	96.32547-7005
39	2	2	2	2	2	2	Sealing Washer	95.99187-0036
40	14	14	14	14	14	14	Washers 10,5; DIN 125, St A3C	On Request
41	12	12	12	12	12	12	Mounting Bolts M10x20;	On Request
42	2	2	2	2	2	2	Blank Plug M10; DIN 934 A3B	On Request
43	1	1	1	1	1	1	Drain Valve Support	96.36560-7033
44	1	1	1	1	1	1	Flue Gas Collector DN 160	96.36400-7003

#	150 Single	150 Cascade Master	150 Cascade Slave	225 Single	225 Cascade Master	225 Cascade Slave	Description	Part Number
o.A.	1	1	1	---	---	---	Flue Spigot Blanking Plug	96.36400-7006
44.6	3	3	3	3	3	3	Heat Exchanger Flue Seal	95.99287-0087
44.7	1	1	1	1	1	1	Appliance Flue Seal	95.99287-0092
44.13	2	2	2	3	3	3	Condensate Waste Elbows	96.36444-7001
44.15	3	3	3	4	4	4	Condensate Elbow Seal	96.36487-7004
44.16	2	2	2	3	3	3	Condensate Elbow Locknut	96.36496-7001
o.A.	1	1	1	---	---	---	Condensate Plug	96.36496-7003
45	2	2	2	3	3	3	Flue Gas Temperature Sensor QAK 36.670/109, M8	94.19314-5023
46	2	2	2	3	3	3	Flue Gas Sensing Tapping	95.95120-0035
o.A.	1	1	1	---	---	---	Flue Gas Sensing Plug	95.23188-0052
47	1	1	1	1	1	1	Gas Distribution Pipe	96.36344-7013
48	1	1	1	1	1	1	Combustion Air Collector	96.36400-7004
o.A.	1	1	1	---	---	---	Combustion Air Plug DN 60	96.36400-7007
48.7	1	1	1	1	1	1	Combustion Air Seal DN 125	95.99287-0091
49	2	2	2	3	3	3	LMU64 Controller Plate	96.35660-7005
50	2	2	2	3	3	3	LMU64 Controller 6.3 A Fuse	95.95112-0019
51	2	2	2	3	3	3	Module Controller LMU 64.015C180,	96.39100-7026
52	2	2	2	3	3	3	OCI420 Communication Clip	96.39100-7023
53	8	8	8	12	12	12	LMU64 Controller Mounting Screws	On Request
54	6	6	6	8	8	8	LMU64 Controller Mounting Bracket	95.99194-0009
55	1	1	1	1	1	1	Wiring Connections Label	96.38791-7028
56	1	1	1	1	1	1	Wiring Connections Strip	96.39216-7005
57	2	2	2	2	2	2	Strip Mounting Screws	On Request
58	1	1	1	1	1	1	Wiring Connection Cover Plate	96.35560-7001
59	4	4	4	4	4	4	Cover Plate Mounting Screws	On Request
60	1	1	1	1	1	1	Condensate Neutralising Box	94.68500-4124
61	1	1	1	1	1	1	Condensate Feed Pipe	96.36444-7003
63	1	1	1	1	1	1	Condensate Outlet Pipe	96.36444-7005
65	2	2	2	2	2	2	Condensate Outlet Adapter	96.36496-7002
66.1	2	2	2	3	3	3	Heat Exchanger	96.31000-7006
66.2	4	4	4	6	6	6	Sealing Washer	95.99187-0029
66.3	4	4	4	6	6	6	Flow / Return Sensor QAK 36.350	94.19314-5011
66.4	4	4	4	6	6	6	Manual Air Release 3/8	96.00025-0019
66.5	2	2	2	3	3	3	Burner Door	96-34600-7006
66.6	2	2	2	3	3	3	Burner Door Seal	96.00025-1220
66.7	2	2	2	3	3	3	Burner Door Air / Gas Seal	96.00025-1255
66.8	2	2	2	3	3	3	Burner Door Insulation	96.31587-7002
66.9	12	12	12	18	18	18	Burner Door Nuts M10	96.00025-1082
66.10	2	2	2	3	3	3	Ignition/Rectification Gasket	96.34487-7001
66.11	2	2	2	3	3	3	Ignition/Rectification Electrode	96.34236-7001
66.12	2	2	2	3	3	3	Burner (l = 238,5mm)	96.00025-2111
66.13	8	8	8	12	12	12	Toothed Washer A 6,4 (V2A)	95.99197-0206
66.14	8	8	8	12	12	12	Burner Mounting Screws M6	95.99194-0046
66.15	2	2	2	3	3	3	Burner Graphite Gasket	96.00025-1745
66.16	2	2	2	3	3	3	Fan Outlet Gasket	96.00025-2107
66.17	2	2	2	3	3	3	Premix Adapter Plate	96.34784-7007
66.18	6	6	6	9	9	9	Premix Adapter Mounting Screws	95.99194-0017

#	150 Single	150 Cascade Master	150 Cascade Slave	225 Single	225 Cascade Master	225 Cascade Slave	Description	Part Number
66.19	2	2	2	3	3	3	Combustion Fan RG 148	96.34000-7006
66.20	8	8	8	12	12	12	Fan Outlet Mounting Screws M5	On Request
66.21	4	4	4	6	6	6	Electrode Mounting Screws M4	On Request
66.22	2	2	2	3	3	3	Non Return Valve Base	96.34317-7001
66.23	6	6	6	9	9	9	Non Return Valve Mounting Screws 3,9x9,5	On Request
66.24	2	2	2	3	3	3	Non Return Valve Gasket	96.34387-7001
66.25	2	2	2	3	3	3	Non Return Valve Plate	96.34318-7001
66.25.3	2	2	2	3	3	3	Non Return Valve Circlip	95.99197-0011
66.26	2	2	2	3	3	3	Non Return Valve Spindle	96.34394-7001
66.27	2	2	2	3	3	3	Non Return Valve Spring	95.23171-0013
66.28	2	2	2	3	3	3	Fan Inlet Gasket	96.00025-0006
66.29	2	2	2	3	3	3	Fan Inlet Tube	96.34784-7008
66.30	6	6	6	9	9	9	Fan Inlet Tube Mounting Screws M6x12	95.99194-0612
66.31	2	2	2	3	3	3	Gas Injector Sealing Grommet	96.00025-1254
67	7	7	7	9	9	9	Return Pipe Seals	95.99187-0004
68	2	2	2	3	3	3	Module Pump 7m	96.32100-7025
o.A.	1	1	1	---	---	---	Blanking Plug For Pump	95.23188-7003
69	8	8	8	12	12	12	Heat Exchanger Header Seals	95.99187-0017
70	2	2	2	3	3	3	Heat Exchanger Flow Connection	96.36144-7017
71	2	2	2	3	3	3	Heat Exchanger Return Connection	96.36144-7041
72	---	---	---	1	1	1	Lower Module Return Pipe	96.36144-7043
73	1	1	1	1	1	1	Middle Module Return Pipe	96.36144-7044
74	1	1	1	1	1	1	Upper Module Return Pipe	96.36144-7045
75	8	8	8	9	9	9	Flow Pipe & Gas Pipe Seals	95.99187-0006
76	2	2	2	3	3	3	Module Flow Pipe (All)	96.36144-7018
o.A.	1	1	1	---	---	---	Header Flow / Return Plug	95.99185-0208
77	2	2	2	3	3	3	Module Gas Valve 240V	96.34500-7007
78	2	2	2	3	3	3	Gas Injector Seal	95.99187-0022
79	2	2	2	3	3	3	Gas Injector Natural Gas 15mm	96.34344-7080
79	2	2	2	3	3	3	Gas Injector LPG 10mm	96.34344-7081
80	2	2	2	3	3	3	Gas Valve Inlet Flange Seal	95.99287-0067
81	2	2	2	3	3	3	Gas Valve Inlet Pipe	96.36344-7014
o.A.	1	1	1	---	---	---	Gas Pipe Cap	95.99185-0208
82	4	4	4	6	6	6	Gas Valve Flange Screws; M4 x 25	On Request
83	4	4	4	6	6	6	Gas Valve Flange Screws; M4 x 12	On Request
84	2	2	2	3	3	3	Gas Injector Circlip	96.00025-1055
85	2	2	2	2	2	2	Hinge For Control Console	96.00025-8207
86	1	1	1	1	1	1	Control Console	96.35760-7008
87	2	2	2	2	2	2	Hinge For Control Panel	96.00025-8206
88	2	2	2	2	2	2	Hinge Mounting Screws	95.99198-0030
89	1	1	1	1	1	1	Appliance Electrical Isolator	96.39444-7002
90	1	1	1	1	1	1	Appliance Pressure Manometer	96.33590-7003
91	2	2	2	3	3	3	Module Displays AGU 2.361	96.39100-7036
o.A.	1	1	2	---	---	1	Module Display Blanking Plate	94.85560-5020
92	1	1	---	1	1	---	Appliance Cascade Manager RVA 47.320/380	96.39100-7024

#	150 Single	150 Cascade Master	150 Cascade Slave	225 Single	225 Cascade Master	225 Cascade Slave	Description	Part Number
93	8	8	8	8	8	8	Mounting Post AD-510, 4x12,5	On Request
94	1	1	1	1	1	1	Appliance Fuse Holder	96.39400-7001
95	4	4	4	4	4	4	Side Panel	96.35160-7002
96	8	8	8	8	8	8	Panel Spring Clips	94.15371-5001
97	2	2	2	2	2	2	Top & Lower Front Panel	96.35360-7025
98	1	1	1	1	1	1	Upper Front Panel	96.35360-7026
99	2	2	2	2	2	2	Magnetic Catch	96.36689-7009
100	2	2	2	2	2	2	Catch Mounting Screws	On Request
101	1	1	1	1	1	1	Control Panel Door	96.35360-7027
102	1	1	1	1	1	1	Retractable Pin Hinge	96.36689-7007
103	1	1	1	1	1	1	Protective Cover Plate	96.35360-7028
104	2	2	2	2	2	2	Name Badge Clip	95.99198-0029
105	1	1	1	1	1	1	Spring Disk Clip	On Request
106	1	1	1	1	1	1	Hexagonal Locking Nut M5	On Request
107	1	1	1	1	1	1	MHG Badge	On Request
108	2	2	2	2	2	2	Drain Valve 1/2	96.00025-0022
109	2	2	2	3	3	3	Flue gas sensing Tube Di=12x1, L=650	95.95213-0025
110	3	3	3	3	3	3	Flue Gas sensing End Cap d=12 mm	95.23188-0044
111	2	2	2	3	3	3	Combustion Air Supply Pipe (Flexible, d=60mm)	96.00025-8149
112	5	5	5	6	6	6	Securing Ring, 50-65 mm	96.00025-8160
o.A.	1	1	1	1	1	1	Appliance Wiring Harness	96.39200-7026
o.A.	2	2	2	3	3	3	Module Wiring Harness	96.39200-7027
o.A.	2	2	2	3	3	3	LMU64 to OCI420 Clip Wiring Connector	96.39200-7015
o.A.	2	2	2	3	3	3	Module Ignition Cable & Cap	96.39200-7028
o.A.	1	1	1	1	1	1	LMU64 to Display Ribbon Cable Lower Module	96.39200-7029
o.A.	1	1	1	1	1	1	LMU64 to Display Ribbon Cable Middle Module	96.39200-7030
o.A.	1	1	1	1	1	1	LMU64 to Display Ribbon Cable Upper Module	96.39200-7031
o.A.	2	2	2	3	3	3	Electrode Earth Lead 450mm	96.39200-7032
o.A.	2	2	2	3	3	3	Flow / Return Wiring Harness	96.39200-7034
o.A.	1	1	1	1	1	1	Pump Wiring Harness	96.39200-7035
o.A.	2	2	2	3	3	3	Pump Electrical Connection	96.39200-7036
o.A.	---	---	---	1	1	1	Transport Documentation	96.39200-7042
o.A.	1	1	1	---	---	---	Transport Documentation	96.39200-7043
o.A.	X	X	X	X	X	X	Screw Set	96.36600-7080
o.A.	2	2	2	2	2	2	Condensate Neutralising Granules 1.4Kg	94.18564-5006
o.A.	1	1	1	1	1	1	ProCon Combustion Chamber Cleaning Granules	On Request

21.0 Installer / End User Notes

[illegible]